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Tiivistelmä – Referat – Abstract

Lisääntynyt tekoälyn hyödyntäminen on herättänyt viime aikoina paljon keskustelua oikeustieteen saralla. Muun muassa itseohjautuviin autoihin liittyvät sopimuksen ulkopuoliset vastuukysymykset ja algoritmien hyödyntäminen oikeudellisessa päätöksenteossa ovat saaneet tässä keskustelussa paljon huomiota. Tekoälyä hyödynnetään hyvin monipuolisesti muillakin aloilla. Vähemmälle tarkastelulle ovat jääneet tekoälyn hyödyntämisen vaikutukset sopimusoikeuden näkökulmasta.

Sähköisen kaupankäynnin lisääntyessä vuosituhannen vaihteessa katsottiin tarpeelliseksi päivittää sitä koskevaa sääntelyä tietyiltä osin. Tutkielman tavoitteena on selvittää, tuoko tekoälyn hyödyntäminen sellaisia uusia elementtejä digitaalisesti tehtyihin sopimuksiin, joiden vuoksi sopimusoikeutta koskevaa lainsäädäntöä olisi jälleen aihetta päivittää. Yksi keskeinen tätä hypoteesia puoltava havainto on tekoälyn valmius toimia hyvinkin autonomisesti. Tämä piirre vaikuttaa erottavan tekoälyyn perustuvat sopimukset muista digitaalisista sopimuksista.

Ennen sopimusoikeudellisten vaikutusten arviointia tutkielmassa tarkastellaan, kuinka tekoälyä parhaillaan hyödynnetään sopimuksia tehtäessä. Havaitaan, että tekoälyä hyödynnetään jo nyt varsin monipuolisesti muun muassa sopimusehtojen tarkastamisessa, hinnoittelussa sekä ultranopeassa kaupankäynnissä rahoitusmarkkinoilla. Tutkielman pääasiallisena tavoitteena on arvioida sitä, ovatko olemassa olevat sopimusoikeuden säännöt riittäviä sääntelemään tekoälyn avulla solmittua sopimusta. Arviointi tehdään yllä mainittujen tekoälyn käyttökohteiden pohjalta. Arviointi on rajattu koskemaan Suomen oikeutta ja siinä tarkastellaan neljää sopimusoikeudellista kysymystä, jotka voivat olla ongelmallisia tekoälyn erityispiirteiden vuoksi:

- Toteutuuko tahdonilmaisu riittävällä tavalla, kun sopimusta tehtäessä hyödynnetään tekoälyä?
- Voidaanko erehdystä koskevia sääntöjä soveltaa, jos tekoäly toimii ennalta arvaamattomalla tavalla?
- Miten vilpittömän mielen käsitettä tulisi soveltaa tekoälyn avulla tehtyjen sopimuksien yhteydessä?
- Vaikuttaako tekoälyn hyödyntäminen sopimuksen tulkintaan?

Tutkielmassa havaitaan, että tekoälyn rooli sopimuksen teossa vaihtelee paljon. Yksinkertaisimmillaan tekoälyä hyödynnetään apuvälineenä tietyn toiminnon automatisoinnissa. Tekoäly voi myös toimia vaativimmissa sovelluksissa autonomisessa roolissa siten, että älykäs tekoälyyn perustuva sovellus neuvottelee ja toimeenpanee sopimuksen itsenäisesti. Tekoälyn toimiessa autonomisessa roolissa sen erityispiirteiden havaittiin vaikuttavan eniten tässä tutkielmassa tarkasteltuihin sopimusoikeudellisiin kysymyksiin.

Avainsanat – Nyckelord – Keywords
Sopimusoikeus, tekoäly, algoritmit

Ohjaaja tai ohjaajat – Handledare – Supervisor or supervisors
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Artificial Intelligence in the Formation of Contracts

An analysis of the adequacy of the Finnish contract law regime with regard to artificial intelligence

Master's thesis
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BIBLIOGRAPHY

Literature and reports

Allen – Widdison (1996)

Allen, Tom – Widdison, Robin, 1996. Can computers make contracts? *Harvard Journal of Law & Technology* vol. 9(1) 1996: 26–52.

Annola (2016)

Annola, Vesa, 2016. *Sopimustulkinta: Teoria, vaiheet, menettely.* Alma Talent Oy.

Bellia (2001)

Bellia, Anthony, 2001. Contracting with electronic agents. *Emory Law Journal* vol. 50 2001: 1047– 1092.

Bringsjord – Govindarajulu (2018)

Bringsjord, Selmer – Govindarajulu, Naveen Sundar, 2018. Artificial Intelligence. *The Stanford Encyclopedia of Philosophy,* Winter 2019 edition. Available at https://plato.stanford.edu/archives/win2019/entries/artificial-intelligence/ (last visited 20 April 2020).

Casey – Niblett (2017)

Casey, Anthony – Niblett, Anthony, 2017. Self-Driving Contracts. *Journal of Corporation Law* vol. 43(1) 2017: 1–34.

Chopra – White (2011)

Chopra, Samir – White, Laurence, 2011. *A Legal Theory for Autonomous Artificial Agents*. University of Michigan Press.

European University Institute (2018)

European University Institute, Department of Law, 2018. Consumer law and artificial intelligence – Challenges to the EU consumer law and policy stemming from the business' use of artificial intelligence. *Final report of the ARTSY project* vol. 11 2018.

Fischer (1997)
Fischer, John, 1997. Computers as Agents: A Proposed Approach to Revised U.C.C. Article 2. *Indiana Law Journal* vol. 72(2) 1997: 545–570.

Frankish – Ramsey (2014)
Frankish, Keith – Ramsey, William (*Eds.*), 2014. *The Cambridge Handbook of Artificial Intelligence*. Cambridge University Press.

Havu – Roslin (2019)
Havu, Katri – Roslin, Waltter, 2019. Tekoäly ja vahingonkorvausvastuu media- ja viestintäalalla: teoreettisia lähtökohtia ja valikoituja havaintoja. *Lakimies* vol. 7-8 2019: 896–927.

Hemmo – Hoppu (2019)
Hemmo, Mika – Hoppu, Kari, 2019. *Sopimusoikeus*, e-book last updated 12/2019. Sanoma Pro Talentum Media.

High-level Expert Group on Artificial Intelligence (2019)
High-level Expert Group on Artificial Intelligence, 8 April 2019. *A definition of AI: main capabilities and disciplines – Definition developed for the purposes of the AI HLEG's deliverables*. Available at https://ec.europa.eu/digital-single-market/en/news/definition-artificial-intelligence-main-capabilities-and-scientific-disciplines (last visited 20 April 2020).

Hirvonen (2011)
Hirvonen, Ari, 2011. *Mitkä metodit?* Yleisen oikeustieteen julkaisuja

Hogg (2011)
Hogg, Martin, 2011. *Promises and Contract Law - Comparative Perspectives*. Cambridge University Press.

af Hällström (1931)
af Hällström, Erik, 1931. *Om villfarelse såsom divergens mellan vilja och förklaring vid rättshandlingar på förmögenhetsrättens område.* Helsinki.

Innanen – Saarimäki (2012)
Innanen, Antti – Saarimäki, Jarkko, 2012. *Internetoikeus*. Edita Publishing Oy.

Kirilenko – Lo (2013)
Kirilenko, Andrei – Lo, Andrew, 2013. Moore's Law versus Murphy's Law: Algorithmic Trading and Its Discontents. *Journal of Economic Perspectives* vol. 27(2) 2013: 51–72.

Kurki (2018)
Kurki, Visa, 2018. Ei vain oikeuskelpoisuutta – oikeussubjektikäsityksemme ongelmia ja uudelleenarviointia. *Lakimies* vol. 5 2018: 469–492.

Kierkegaard (2007)
Kierkegaard, Sylvia, 2007. E-Contract Formation: US and EU Perspectives. *Journal of Law, Commerce, and Technology* vol. 12(3) 2007. Available at http://digital.law.washington.edu/dspacelaw/bitstream/handle/1773.1/396/vol3_no3_art12.pdf?sequence=1 (last visited 20 April 2020).

Koulu (2018)
Koulu, Riikka, 2018. Digitalisaatio ja algoritmit – oikeustiede hukassa? *Lakimies* vol. 7–8 2018: 840–867.

Koskinen (2018)
Koskinen, Ida, 2018. Koneoppiminen ja EU:n yleisen tietosuoja-asetuksen vaatimus lainmukaisesta, kohtuullisesta ja läpinäkyvästä käsittelystä. *Defensor Legis* vol. 2 2018: 240–256.

Laine (2001)
Laine, Juha, 2001. Chapter 6: Verkkokaupan sopimuksista, 195–246, in Laine, Juha (*Ed.*), *Verkkokauppaoikeus.* WSOY.

Lauslahti – Mattila – Seppälä (2016)
Lauslahti, Kristian – Mattila, Juri – Seppälä, Timo, 2016. Report nro. 57 by Elinkeinoelämän tutkimuslaitos. Älykäs sopimus – Miten blockchain muuttaa

sopimuskäytäntöjä? Available at https://pub.etla.fi/ETLA-Raportit-Reports-57.pdf (last visited 20 April 2020).

Law Geex (2018)
Law Geex, 2018. Comparing the Performance of Artificial Intelligence to Human Lawyers in the Review of Standard Business Contracts. *A report issued by Law Geex (a private company)* vol. 2 2018.
Available at https://images.law.com/contrib/content/uploads/documents/397/5408/lawgeex.pdf (last visited 20 April 2020).

Lerouge (1999)
Lerouge, Jean-Francois, 1999. The Use of Electronic Agents Questioned Under Contractual Law: Suggested Solutions on a European American Level. *Journal of Computer & Information Law* vol. 18(2) 1999: 403–433.

Moore (1965)
Moore, Gordon, 1965. Cramming more components onto integrated circuits. *Electronics* vol. 38(8) 1965: 114–117.

Mäkelä (2008)
Mäkelä, Juha, 2008. Sopimuksen yhtenäinen sitovuusperuste. *Lakimies* vol. 1 2008: 20–41.

Mäkelä (2010)
Mäkelä, Juha, 2010. *Sopimus ja erehdys.* Suomalainen lakimiesyhdistys.

Nurmi (1997)
Nurmi, Risto, 1997. *Elektroninen sopimus.* Lakimiesliiton Kustannus.

Pagallo (2013)
Pagallo, Ugo, 2013. *The Laws of Robots: Crimes, Contracts, and Torts.* Springer.

Russel – Norvig (2003)

Russel, Stuart – Norvig, Peter, 2003. *Artificial Intelligence: A Modern Approach*, 2nd edition. Pearson Education, Inc.

Saarnilehto – Annola (2018)
Saarnilehto, Ari – Annola, Vesa, 2018. *Sopimusoikeuden perusteet*, 8th edition. Talentum.

Sartor (2009)
Sartor, Giovanni, 2009. Cognitive automata and the law: electronic contracting and the intentionality of software agents. *Artificial Intelligence and Law* vol. 17(4) 2009: 253–290.

Rotolo – Sartor – Smith (2009)
Rotolo, Anotonino – Sartor, Giovanni – Smith, Clara, 2009. Good faith in contract negotiation and performance. *International Journal of Business Process Integration and Management* vol. 4(3) 2009: 154–173.

von Savigny (1851–53)
von Savigny, Friedrich Carl, 1851-53. *Das Obligationenrecht als Theil des heutigen Römischen Rechts.* Berlin.

Scholz (2017)
Scholz, Lauren Henry, 2017. Algorithmic Contracts. *Stanford Technology Law Review* vol. 20 2017: 128–169.

Searle (1980)
Searle, John, 1980. Minds, brains, and programs. *Behavioral and Brain Sciences* vol. 3(3) 1980: 417–457.

Smits (2015)
Smits, Jan, 2015. What is legal doctrine? On the aims and methods of legal-dogmatic research. *Maastricht European Private Law Institute Working Paper* vol. 6 2015.

Surden (2012)

Surden, Harry, 2012. Computable Contracts. *U.C. Davis Law Review* vol. 46 2012: 629–700.

Teubner (2018)

Teubner, Günther, 2018. Digital Personhood? The Status of Autonomous Software Agents in Private Law. *Ancilla Iuris* 2018: 106–149.

Turin (1950)

Turin, Alan, 1950. Computing Machinery and Intelligence. *Mind* vol. 59(236) 1950: 433–460.

UNCITRAL/UNIDROIT (2019)

UNCITRAL/UNIDROIT, 7 May 2019. *Summary of the Discussion and Conclusions of the joint UNCITRAL/UNIDROIT workshop*. Available at https://www.unidroit.org/89-news-and-events/2663-uncitral-unidroit-workshop-on-smart-contracts-artificial-intelligence-and-distributed-ledger-technology-summary-of-conclusions-published (last visited 20 April 2020).

Viljanen (2017a)

Viljanen, Mika, 2017. Algoritmien haaste – uuteen aineelliseen oikeuteen? *Lakimies* vol. 7-8 2017: 1070–1087.

Viljanen (2017b)

Viljanen, Mika, 2017. Oikeutta kyborgeille. *Lakimies* vol. 1 2017: 25–50.

Weitzenböck (2001)

Weitzenböck, Emily, 2001. Electronic Agents and the Formation of Contracts. *International Journal of Law and Information Technology* vol. 9(3) 2001: 204–234.

Weitzenböck (2004)

Weitzenböck, Emily, 2004. Good faith and fair dealing in contracts formed and performed by electronic agents. *Artificial Intelligence and Law* vol. 12 2004: 83–110.

World Wide Web Foundation (2017)
World Wide Web Foundation, 2017. *Algorithmic Accountability - Applying the concept to different country contexts*. Available at https://webfoundation.org/docs/2017/07/Algorithms_ Report_WF.pdf (last visited 20 April 2020).

Ying (2017)
Ying, Huang, 2017. The Art of Contract Drafting in the Age of Artificial Intelligence: A Comparative Study Based on US, UK and Austrian Law. *Stanford-Vienna Transatlantic Technology Law Forum Working Papers* No. 26 2017. Available at https://law.stanford.edu/publications/the-art-of-contract-drafting-in-the-age-of-artificial-intelligence-a-comparative-study-based-on-us-uk-and-austrian-law/ (last visited 20 April 2020).

Legislative preparatory work, case law and soft law instruments

Committee memorandum of the Ministry of Justice (1990:20)

Committee memorandum of the Ministry of Justice (8 March 2001)

Government proposal (194/2001 vp)

Government proposal (221/2013 vp)

European Parliament Resolution (2015/2103(INL))
European Parliament, 2015. *European Parliament resolution on civil law rules on robotics (2015/2103(INL)).*

UNCITRAL Model Law on Electronic Commerce with Guide to Enactment (1996)

United Nations Convention on the Use of Electronic Communications in International Contracts with Explanatory Note (2005)

Judgment 2018:37 of the Supreme Court of Finland

Judgment 2016:8 of the Supreme Court of Finland

Judgment 2012:86 of the Supreme Court of Finland

Judgment 2011:21 of the Supreme Court of Finland

Judgment 2011:6 of the Supreme Court of Finland

Judgment 2010:23 of the Supreme Court of Finland

Judgment 2008:57 of the Supreme Court of Finland

Judgment 2006:71 of the Supreme Court of Finland

Judgment 1990:30 of the Supreme Court of Finland

Other sources

English (2019)

English, Trevor, 23 October 2019. How Do Stock Trading Algorithms Work? *Interesting Engineering*. Available at https://interestingengineering.com/how-do-stock-trading-algorithms-work (last visited 20 April 2020).

Karlinsky (2019)

Karlinsky, Neal, 5 June 2019. How artificial intelligence helps Amazon deliver? *Amazon blog*. Available at https://blog.aboutamazon.com/innovation/how-artificial-intelligence-helps-amazon-deliver (last visited 20 April 2020).

Kotovirta (2019–2020)

Kotovirta, Ville (Research Team Leader at VTT Technical Research Centre of Finland), 2019–2020. *Four mentoring sessions and literature recommendations on artificial intelligence* (autumn 2019 and spring 2020)

Makoff (2005)

Makoff, John, 18 April 2005. It's Moore's Law, but Another Had the Idea First. *The New York Times.* Available at https://www.nytimes.com/2005/04/18/technology/its-moores-law-but-another-had-the-idea-first.html (last visited 20 April 2020).

Kuusisalo (2016)

Kuusisalo, Mikko, 12 Marck 2016. Tekoäly päihitti jälleen ihmisen – go-suurmestari hävisi kolme peliä peräkkäin. *Yle uutiset.* Available at https://yle.fi/uutiset/3-8739267 (last visited 20 April 2020).

Snow (2017)

Snow, Jackie, 7 October 2017. New Research Aims to Solve the Problem of AI Bias in "Black Box" Algorithms. *MIT Technology Review.* Available at https://www.technologyreview.com/s/609338/new-research-aims-to-solve-the-problem-of-ai-bias-in-black-box-algorithms/ (last visited 20 April 2020).

Taylor (2015)

Taylor, Harriet, 12 October 2015. Airbnb launches 'Smart Pricing' for hosts. *CNBC.* Available at https://www.cnbc.com/2015/11/12/airbnb-launches-smart-pricing-for-hosts.html (last visited 20 April 2020).

Tuominen (2019)

Tuominen, Joonas, 14 November 2019. Sovelluksemme purkaa sopimuksia kuin ihmislakimies – Katso esitys AI Monday tapahtumasta. *Tekniikka & Talous.* Available at https://www.tekniikkatalous.fi/uutiset/sovelluksemme-purkaa-sopimuksia-kuin-ihmislakimies-katso-esitys-ai-monday-tapahtumasta/ff68f5f0-af27-4aed-840a-a349617af9ba (last visited 20 April 2020).

Wohlner (2019)

Wohlner, Roger, 19 August 2019. What Is High Frequency Trading and How Does It Work? *The Street.* Available at https://www.thestreet.com/investing/what-is-high-frequency-trading-15060995 (last visited 20 April 2020).

INTRODUCTION

Background[1]

In his renowned article from 1965 Gordon E. Moore predicted that the development of integrated circuits will result in exponential acceleration of computing power and considerably reduced production costs of effective computers.[2] As the title of Moore's article suggests, the key to such development would be to cram more components onto integrated circuits. In the article, Moore proposed that the number of components that can be placed on an integrated circuit would continue to double every year (this prediction later on became known as "Moore's law").[3] Moore's prediction on the exponential growth of the computing power has proved to be at least roughly accurate and the exponentially increased computing power can be regarded as one explanation for the hype around artificial intelligence these days.

Artificial intelligence is today used in many tasks that were traditionally manageable by human beings only. First example of artificial intelligence that comes to mind is probably a self-driving car, but artificial intelligence is also used in contract formation, amongst many other possible fields of application. As an example, trading on stock exchanges may be based on autonomously acting machine-learning algorithms.[4] Contract formation, including demanding tasks such as drafting terms, negotiating and pricing, used to be something that only human beings were able to do. The rules of contract law are therefore initially aimed at regulating the behaviour of human beings. The question then follows, whether the rules on contract formation are up to date to regulate such scenarios where artificial intelligence is used in the contract formation process and the human involvement is significantly reduced.

Today's contracting practice thus seems more and more diverse. It is obvious that contracting no longer necessarily means two persons negotiating face-to-face and agreeing to certain terms on a piece of paper. Thanks to the development of communication technologies, contracting more likely occurs remotely via a communication device, such as

[1] Research Team Leader Ville Kotovirta at VTT Technical Research Centre of Finland has provided highly valuable guidance, inspiration and background information on artificial intelligence for which the author of this thesis remains extremely grateful. The author also wants to thank Professors Mika Hemmo and Ville Pönkä at University of Helsinki who have kindly supported the author from the legal point of view by providing beneficial comments to draft versions of this thesis.

[2] Moore 1965.

[3] See e.g. Makoff 2005.

[4] See e.g. English 2019.

a telephone, email, or a piece of software. But this is not a piece of news. Also the legislator has noted the specific regulatory needs of e.g. distance selling and electronic commerce a while ago, already.[5]

Research question and structure

The hypothesis of this paper is that, while new artificial intelligence based technologies evolve, contracting technologies are undergoing a transition to become of more and more autonomous character. Namely, one characteristic of artificial intelligence is autonomy, i.e. the capacity to interact with other actors independently from its principal.[6] The question then arises, whether this might cause a need to reassess the rules of contract law. The fundamental assumption in contract law is that a contract is concluded between two *persons* each expressing their will to enter into a contract on certain terms.[7] An illustrative description of this humane feature is the often-used reference of a contract as the 'meeting of the minds'.[8]

Currently, it seems that the increasing use of artificial intelligence technologies is about to reduce this humane feature of contracting. What are the legal consequences if the humane aspect in contract formation decreases or even disappears? This concern has been raised, amongst others, in the European Parliament resolution on civil law rules on robotics (2015/2103(INL)) where it was suggested that the current contractual rules were inadequate taking into account the new technological developments.[9] The adequacy of current legislation was also questioned more recently in a UNCITRAL/UNIDROIT workshop on smart contracts, artificial intelligence and distributed ledger technology in May 2019.[10] *As a response to these concerns, the purpose of this thesis is to evaluate, whether the increasing use of artificial intelligence truly imposes a need to revise the rules applicable to contract formation.*

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[5] As an example, Chapter 6 of the Finnish Consumer Protection Act 38/1978 provides specific information duties on the seller and a right of withdrawal for the consumer in defined cases of distance selling, such as online shopping.

[6] The essential characteristics of artificial intelligence will be further discussed in Chapter 1.

[7] Hemmo – Hoppu 2019, Chapter 6 Sopimuksen tekeminen → Sopimuksen syntyminen → Tahdonilmaisut.

[8] See e.g. Hogg 2011, 50.

[9] In the resolution it is noted that "the shortcomings of the current legal framework are also apparent in the area of contractual liability insofar as machines designed to choose their counterparts, negotiate contractual terms, conclude contracts and decide whether and how to implement them make the traditional rules inapplicable, which highlights the need for new, efficient and up-to-date ones, which should comply with the technological development and the innovations recently arisen and used on the market".

[10] UNCITRAL/UNIDROIT 2019. In the workshop summary it is, amongst others, noted that "(t)he panellists stressed the importance of identifying the point at which new technologies become disruptive and are no longer adequately covered by existing law so that new regulation is required.".

The scope of the evaluation is limited to only assessing the general rules and doctrines of Finnish contract law on the formation of contracts. Specific rules, such as consumer law rules or rules specific to certain contract types (e.g. sale of immovable property) have been left out in order to allow a sufficiently detailed analysis of the general rules and doctrines. Furthermore, it seems that this topic has not yet been discussed from the perspective of Finnish law and thereby it is rational to start the analysis from the general rules.[11] The evaluation will thus mainly focus on chapter one of the Finnish Contracts Act (228/1929) including the essential rules on formation of contracts and the general principles of contract law.

The structure of this thesis will be as follows. It is first necessary to introduce the reader to the essential characteristics of artificial intelligence (Chapter 1). Thereafter, some artificial intelligence based contracting technologies will be presented in Chapter 2 as concrete examples of how artificial intelligence is currently being used in contract formation. In this context, it is also analysed, what kind of role said technology takes in contract formation (see Illustration 1). In order to structure the following discussion, the introduced examples of artificial intelligence based contracting technologies are also systemised according to their level of autonomy (see Illustration 2). After that, the intention is to move on to analysing the rules. First, it will be described how the Finnish legislator has previously taken into account the development of new contracting technologies, in particular with regard to the rise of electronic commerce (Chapter 3). In this context also the relevant rules of the UNCITRAL Model Law and United Nations Convention on Electronic Commerce will be briefly presented as a reference. Thereafter, the purpose of Chapter 4 is to analyse, what new questions and/or problems may occur when artificial intelligence based technologies are used in contract formation. Are the existing rules sufficient to solve them? It is not possible to thoroughly analyse all the rules applicable to contract formation, but some hypothetical problems have been identified and selected for more profound analysis. The Illustrations show that artificial intelligence may be used in various roles in contract formation. Therefore, three examples of artificial intelligence based contracting technologies have been chosen as test cases in order to analyse the selected problems. In the end, it will be concluded whether, based on the analysis, the Finnish rules on contract formation seem adequate.

[11] There is some Finnish discussion from other angles of the topic 'AI and law', see e.g. Havu – Roslin 2019; Koulu 2018; Koskinen 2018; Kurki 2018; Viljanen 2017a; Viljanen 2017b.

Research method and sources

The discussion around the regulation of artificial intelligence often remains on a rather superficial level without diving into a detailed analysis of potential regulatory problems. This thesis aims to concretise the discussion, as the purpose is to identify, what particular aspects might be problematic. In this thesis, the adequacy of the rules is analysed by using concrete examples of artificial intelligence technology. First, hypothetical problems of certain rules are identified and then, the adequacy of the rules is tested by trying to apply said rules to concrete contracting technologies.

It follows that the method of this thesis is closest to the legal-dogmatic approach[12]: the intention is to observe the existing law and to examine how its rules are applied in the context of a new technology, i.e. in the context of contracts formed with the help of artificial intelligence based technologies.

As noted above, some Finnish legal literature exist on the regulation of artificial intelligence but no literature focusing on the rules of contract law has been identified when doing the background research for this thesis. Lauslahti, Mattila, and Seppälä have interestingly discussed the regulation of smart contracts in a report published in 2016, but in the report they specifically note that smart contracts are typically not based on artificial intelligence technology but on blockchain technology.[13] Blockchain technology typically enables contract automation subject to certain beforehand-defined parameters, but unlike some artificial intelligence based technologies, the technology is not typically acting autonomously.[14] Internationally, there exist a lot of literature on the regulation of artificial intelligence, also from the perspective of contract law. International literature has also been taken into account to the extent possible and necessary for the purposes of this thesis.

1. What is artificial intelligence?

1.1 Some characteristics of artificial intelligence

This thesis aims at providing a legal analysis, not a technical one. However, as the analysis concerns the adequacy of certain rules with regard to artificial intelligence based technologies ("AI"), the precondition for the legal analysis is to understand at least the most essential features of AI. It seems that it is not necessary to go too much into detail of

[12] Hirvonen 2011, 36–53; Smits 2015.
[13] Lauslahti – Mattila – Seppälä 2016.
[14] *Ibid.*, 18.

the technicalities of AI but to focus on understanding what kinds of functions AI based technologies are capable to perform and what kinds of AI based contracting solutions are already in use.

The term AI seems to be an umbrella term to various technologies and subfields and there is no one commonly recognised definition of AI. A high-level expert group on artificial intelligence ("AI HLEG") appointed by the European Commission has recently suggested the following working definition on AI:

> "artificial intelligence (AI) systems are software (and possibly also hardware) systems designed by humans that, given a complex goal, act in the physical or digital dimension by perceiving their environment through data acquisition, interpreting the collected structured or unstructured data, reasoning on the knowledge, or processing the information, derived from this data and deciding the best action(s) to take to achieve the given goal. AI systems can either use symbolic rules or learn a numeric model, and they can also adapt their behaviour by analysing how the environment is affected by their previous actions. As a scientific discipline, AI includes several approaches and techniques, such as machine learning (of which deep learning and reinforcement learning are specific examples), machine reasoning (which includes planning, scheduling, knowledge representation and reasoning, search, and optimization), and robotics (which includes control, perception, sensors and actuators, as well as the integration of all other techniques into cyber-physical systems)."[15]

AI HLEG has emphasized that the above definition is a crude oversimplification. In the following some predominant AI related concepts will be described slightly more in detail, after first briefly discussing the history of AI research.

Even though at first hand AI might come across as a very technical field of research, AI is actually a truly multidisciplinary subject as it has roots in multiple areas of research including philosophy, mathematics, economics, neuroscience, psychology, computer engineering, control theory (i.e. studying the maximisation of objective functionality[16]) and linguistics.[17] AI research may be roughly divided into two schools of thought: those focusing on developing systems that think and/or act as close as possible to human beings

[15] High-level Expert Group on Artificial Intelligence 2019.
[16] Russel – Norvig 2003, 15.
[17] *Ibid.*, 5–16.

(‘a human-centred approach’) and those trying to develop systems that think and/or act as rationally as possible (‘a rationalist approach’).[18]

The roots of AI go back to 1943 when a model of artificial neurons was proposed by Warren McCulloch and Walter Pitts.[19] Amongst other features, they suggested already at that time that neural networks could have the capacity to learn.[20] Another widely recognised early development in AI research is the Turing test developed by Alan Turing in 1950 in his article Computing Machinery and Intelligence” in which Turing tried to provide a definition of intelligence.[21] In the test a person was emailing questions both to a human being and a machine and based on their answers the person should guess which one of the correspondents was the machine.[22] The following preconditions identified in the Turing test for regarding a computer as intelligent are still considered relevant today (the list is by no means exhaustive):

- “**Natural language processing** to enable it to communicate successfully in english,
- **Knowledge representation** to store what it knows or hears,
- **Automated reasoning** to use the stored information to answer questions and to draw new conclusions,
- **Machine learning** to adapt to new circumstances and to detect and explorate patterns,
- **Computer vision** to perceive objects and
- **Robotics** to manipulate objects and move about”.[23]

An event that cannot go unnoticed when discussing the history of AI is the Dartmouth workshop in 1956. The workshop is often referred to as the birthplace of AI research and community. In the workshop a group of AI developers were introduced to each other and

[18] *Ibid.*, 1–5; Also, see Frankish – Ramsey 2014, 15 where a distinction is made between those ’implementing AI systems as traditional computer programs and modelling them after nervous systems’ such as the artificial neural networks.
[19] Russel – Norvig 2003, 16.
[20] *Ibid.*
[21] *Ibid.,* 2.
[22] Bringsjord – Govindarajulu 2018.
[23] Russel – Norvig 2003, 3.

continued their remarkable work at MIT, CMU, Stanford and IBM. Also the term "artificial intelligence" stems from the Dartmouth workshop.[24]

1.1.1 Weak and strong artificial intelligence

An important consideration, in particular from the philosophical angle of AI research, is what should an AI application be able to do in order to be regarded as intelligent. AI technologies are diverse and they may be developed for certain specific tasks or for broader purposes. As an example, it has been suggested that one could make a distinction between "task intelligence" and "thing intelligence".[25] A device would be "task intelligent" if it is able to do a task that would require human intelligence for its execution (such as a calculator calculating a mathematical problem).[26] On the other hand, by "thing intelligence", it is meant that the device itself is intelligent.[27] The current discussion of AI is focused on "thing intelligence" that in turn may be divided into two categories: intelligence similar to human intelligence and artificial intelligence that is not inspired by human intelligence.[28] It is thus noteworthy here that the term *artificial* intelligence does not always refer to human-like intelligence but it might also refer to other kinds of intelligence, even such that a human being might not be able to perceive or predict due to his/hers limited capacity.[29]

Relating to the above, the notions of "weak AI" and "strong AI" introduced by a philosopher John Searle in 1980 are often used in AI related discussion.[30] In the beginning of his article "Minds, Brains, and Programs" he finds it necessary to make a distinction between "weak" and "strong" intelligence:

> "According to weak AI, the principal value of the computer in the study of the mind is that *it gives us a very powerful tool*. For example, it enables us to formulate and test hypotheses in a more rigorous and precise fashion. But according to strong AI, the computer is not merely a tool in the study of the mind; rather, the appropriately programmed *computer really is a mind*, in the

[24] Russel – Norvig 2003, 17; Frankish – Ramsey 2014, 18.
[25] Frankish – Ramsey 2014, 64–65.
[26] Frankish – Ramsey 2014, 64.
[27] Frankish – Ramsey 2014, 65.
[28] *Ibid.*; See also note 18 above discussing the difference between human-centred approach and rationalist approach.
[29] Frankish – Ramsey 2014, 65; As an example of AI's unpredictability see e.g. Kuusisalo 2016 describing that "AlphaGo did unusual and questionable moves that at first hand confused people, but afterwards they made sense".
[30] Frankish – Ramsey 2014, 65; Searle 1980.

> sense that computers given the right programs can be literally said to understand and have other cognitive states. In strong AI, because the programmed computer has cognitive states, the programs are not mere tools that enable us to test psychological explanations; rather, the programs are themselves the explanations."[31] (emphasis added)

In this context it might still be necessary to emphasize the difference between *general* and *specific* intelligence. Even if in some very specific fields, such as chess and the Chinese Go game or more recently restoring ancient Greek text[32], AI has beaten human intelligence, AI is still far from being generally intelligent in any kinds of fields similarly to a human being or from reaching the state of so-called singularity that may be familiar from science fiction.[33]

1.1.2 Machine learning

Machine learning is a subfield of AI. Machine learning techniques aim at developing systems that are capable of improving their performance of a given task. This may be achieved either by providing the system with ideal examples of desired performance or through experience gained over repetition of given task.[34] Machine learning techniques are utilized in e.g. speech recognition, spam filters, online fraud-detection systems and product-recommendation systems.[35]

As already noted, machine learning may take different forms, most importantly supervised learning, unsupervised learning and reinforcement learning.[36] In *supervised learning* the algorithm is taught on the basis of training data including examples on inputs and their correct outputs. Based on the training, the algorithm will learn a function on which basis it should be able to perform on unlabelled raw data.[37] As an example one could think of an image recognition algorithm the task of which is to identify all photos including a cat. In supervised learning the algorithm could be shown labelled example pictures of cats and

[31] Searle 1980, 418.
[32] See a news published on the website of Cornell University on 14 October 2019. Available at https://arxiv.org/abs/1910.06262 (last visited 20 April 2020).
[33] Bringsjord – Govindarajulu 2018.
[34] Bringsjord – Govindarajulu 2018
[35] *Ibid.*
[36] *Ibid.*
[37] *Ibid.*

other pictures, and thereby the algorithm would learn how to recognise the characteristics of a cat.

In *unsupervised learning* the machine is more free: it is not provided any examples on the desired outcomes. Instead, the machine is free to look for interesting patterns of the input data that a human being would not necessarily be able to find. Unsupervised learning is used, for instance, in data mining for analysing a large dataset incomprehensible for a human being.[38] When it comes to the above example on image recognition, in unsupervised learning the algorithm would be shown pictures of cats and other animals, but the pictures were not labelled in beforehand. The algorithm would learn the patterns in the pictures and classify them based on their contents.

In *reinforcement learning* the machine learning algorithm takes actions that are valued by some cumulative reward. Reinforcement learning is used in teaching an algorithm more complex tasks, often including a series of actions in time. In more complex tasks, such as playing a game, it is necessary to take into account the effects of the players' actions to the environment in which the algorithm operates. In simple terms, the algorithm is released in the learning environment where it may freely operate and observe its environment. The algorithm is not supervised and guided throughout its learning process, as it typically receives feedback on its performance only occasionally.[39]

1.1.3 Artificial neural networks

Artificial neural network learning systems are a subcategory of machine learning. As mentioned above, AI research has, amongst other fields, drawn inspiration from neuroscience. Artificial neural networks refer to neurons that are brain cells responsible for collection, processing and dissemination of electrical signals.[40] A human being's capacity to process information is believed to be based on such neurons forming complex networks in a human brain (hence the term "neural network").[41] One goal of AI research is to aim at creating artificial intelligence as close to human intelligence as possible. It is then not surprising that the AI researches are trying to imitate human intelligence by creating neural

[38] *Ibid.*
[39] *Ibid.;* Illustrations of reinforcement learning can be found in YouTube, see e.g. https://www.youtube.com/watch?v=Lu56xVlZ40M (last visited 20 April 2020) in which AI is playing hide and seek with rather surprising outcomes or https://www.youtube.com/watch?v=gn4nRCC9TwQ (last visited 20 April 2020) in which AI based creatures are learning to walk.
[40] Russel – Norvig 2003, 736–737.
[41] *Ibid.*

networks artificially ("artificial neural networks", also known as "computational neuroscience").[42]

A favourable feature of neural networks is in particular, that they perform in a decentralised manner and without being necessary to code therein any behavioural instructions.[43] Also, and similarly to the human brain, they are more resistant to damages than other kinds of systems since despite if some part of the network is damaged, the rest of the network may continue to function. Of course, the level of performance is decreased, but only in proportion to the level of the damages.[44] In conclusion, artificial neural networks have proved to be very popular in AI research and they are regarded as one of the most effective form of artificial learning systems.[45]

1.1.4 Deep learning

Another often cited term when talking of AI is "deep learning". Deep learning is a subcategory of neural networks and it is an abbreviation for "deep neural networks". In simple terms, the structure of neural networks is multi-layered and therefore deep.[46] Deep learning techniques have provided promising results in particular in the field of image and speech recognition.[47] Obviously, it is very burdensome if not even practically impossible to detect how a multi-layered neural network comes to certain conclusion.

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[42] *Ibid.* Also, see Frankish – Ramsey 2014, 52 where a relatively easily understandable description of the functioning of neural networks has been provided: "The basic conceptual and engineering tool of connectionists is the neural network. A neural network consists of a number of nodes (or "units") that resemble brain neurons. Each node receives a number of input signals and delivers an output signal. The nodes are connected to one another so that the output of one node becomes an input to another node. Input and out- put values are typically represented by real numbers. The connections have weights attached to them, which are also represented by real numbers. Intuitively, the weight of a connection represents the influence that one node has on the output of another. The output of each node is a simple linear function of the inputs; typically, the weighted sum of the input values is calculated, and an output of 1 or 0 produced depending on whether or not the sum exceeds a certain threshold. If the output is 1, the node is said to be activated, or to fire; otherwise it is inhibited. Certain units are designated as the input and output nodes of the entire network; typically there is only one output node. Neural networks are capable of a certain type of learning; they can be trained to compute – or approximate – a target function. General-purpose learning algorithms exist, such as back propagation, which, starting with random weights, repeatedly expose the network to different inputs in a training set and adjust the weights so as to bring the output closer to the correct value. Neural networks have been constructed that perform well on various nontrivial cognitive tasks, such as learning the past tense of English verbs or synthesizing speech from written text".

[43] Frankish – Ramsey 2014, 52–53.
[44] *Ibid.*
[45] *Ibid.*
[46] Bringsjord – Govindarajulu 2018.
[47] *Ibid.*

1.1.5 Black box algorithms

Some AI based systems are called "black boxes". This nickname is used to illustrate that, because of its complex structure, it is practically impossible or at least very time consuming to find out how such a system comes to certain conclusion based on the data it has been fed with. Scientists are however trying to develop tools to uncover how such black boxes function. [48]

1.1.6 Intelligent agents

It is still necessary to introduce the term "intelligent agent". In the above the focus has been on describing AI as a technology. But what kind of concrete role may AI take? Can AI be an *actor* instead of merely being used as a *tool*?

Russel and Norvig have chosen to use the term "intelligent agent" in their widely recognised textbook *Artificial Intelligence – A Modern Approach*[49] and therefore said term will also be used in this thesis as an umbrella term for various AI based solutions (instead of e.g. AI agent, software robot, software agent and other terms that seemed too specific).

Russel and Norvig define an intelligent agent to be "anything that can be viewed as perceiving its environment through sensors and acting upon that environment through actuators" and provide an example of a software agent "(a) software agent receives keystrokes, file contents, and network packets as sensory inputs and acts on the environment by displaying on the screen, writing files, and sending network packets".[50] Furthermore, Russel and Norvig suggest that an intelligent agent may only be regarded as *rational* provided it has at least the following features: the ability to gather information, the ability to learn, and to act autonomously.[51] Interesting remark is done regarding the autonomy of an intelligent agent; it is possible that the autonomy is increased overtime while the intelligent agent gathers more information and thereby learns new things.[52]

[48] See e.g. Snow 2017: See also Scholz 2017 discussing black box algorithms from a legal perspective.
[49] Russel – Norvig 2003, 32.
[50] *Ibid.*
[51] Russel – Norvig 2003, 35–38.
[52] *Ibid.,* 38.

2. Contracting with the help of artificial intelligence

2.1 Identifying some contemporary examples of contracting with the help of artificial intelligence

Before moving forward into the legal analysis it is necessary to concretise the discussion. In the following, the purpose is to identify some contemporary examples of using AI in contract formation.

2.1.1 Electronic commerce

Electronic commerce is a rather classical example of a contracting event where intelligent techniques are being used. Today, it is possible to buy flight tickets, many kinds of goods and take considerable loans, amongst other things, at any time of the day online. It is assumed that at least large-scale online traders use intelligent techniques in managing their order flows.

It is, however, difficult to find out what kinds of techniques are being used as the techniques are likely to be trade secrets. Nevertheless, Amazon.com, Inc. ("Amazon") has, for instance, openly announced that artificial intelligence, including machine learning and optimization algorithms, are heavily used in their business.[53] This does not seem to be only marketing talk as the Amazon group has obtained tens of patents on various machine learning solutions.[54] On the other hand, as Amazon's business practices are not transparent to outsiders, it remains unclear, to what extent Amazon has automated its contracting process – and/or whether some functions are autonomous. It might also be the case that AI is only involved in Amazon's internal processes and not directly in contract formation.

2.1.2 Smart pricing

A more concrete example of using AI in contracting is the Smart Pricing tool provided by Airbnb, Inc ("Airbnb").[55] Automated pricing systems have probably been in use already for some time and they are not necessarily always AI based. However, the recent

[53] See e.g. Karlisnky 2019.

[54] On 23 March 2020, 47 search results occurred when searching the patent database Espacenet with "machine learning" and selecting "Amazon Tech Inc" as the applicant. Espacenet patent database is available at https://fi.espacenet.com/?locale=fi_FI .

[55] See instructions on the Smart Pricing tool at Airbnb's website: https://www.airbnb.com/help/article/1168/how-do-i-turn-smart-pricing-on-oroff?_set_bev_on_new_domain=1572868178_MzE2N2E3ZjA3MDQ4&locale=en (last visited 20 April 2020).

developments in AI seem to bring price automation to a next level. As described above, AI is able to learn based on the data it receives and thereby autonomously optimise its functioning. Furthermore, due to its much less limited processing power when compared to a human brain, it may come to conclusions that its principal was not able to predict.

Airbnb is an online platform on which individuals may offer accommodation services to strangers. Smart Pricing tool was launched in 2015[56] and on Airbnb's website it is described as follows:

> "Smart Pricing lets you set your prices to automatically go up or down based on changes in demand for listings like yours. You're always responsible for your price, so Smart Pricing is controlled by other pricing settings you choose, and you can adjust nightly prices any time. Smart Pricing is based on the type and location of your listing, the season, demand, and other factors. (…) Once you turn on Smart Pricing, your prices will be automatically updated within the minimum and maximum prices you set. Smart Pricing works for all open nights on your calendar, and you can adjust specific nightly prices any time."[57]

Smart Pricing tool does not thus lead the price to be freely floating without any parameters, but the Airbnb host needs to set minimum and maximum prices and (s)he can freely update those anytime. Smart Pricing tool adjusts the price within the limits set beforehand and based on information it has been fed with (amongst others, the type and location of the accommodation, the season and demand). Interestingly, it is explicitly noted that the user of a Smart Pricing service (i.e. Airbnb host) is always responsible for the price and this seems to imply that Airbnb does not take any responsibility on the functioning of the pricing tool.[58]

Smart Pricing tool seems to be tempting for the hosts. It is rather time consuming to continuously analyse, what would be the most optimal price at a given time. Also, an Airbnb host does not have as much pricing data available as Airbnb platform that has collected data overtime. Therefore, the Smart Pricing tool might help the Airbnb host to

[56] See e.g. Taylor 2015.

[57] See Airbnb's website accessible at https://www.airbnb.com/help/article/1168/how-do-i-turn-smart-pricing-on-or-off> (last visited 20 April 2020).

[58] See also section 7.1.2 in Airbnb's Terms of Service for European Users "You are solely responsible for setting a price (including any Taxes if applicable, or charges such as cleaning fees) for your Listing ("Listing Fee"). Once a Guest requests a booking of your Listing, you may not request that the Guest pays a higher price than in the booking request." Accessible at https://www.airbnb.com/terms#eusec201910_18 (last visited 20 April 2020).

make a more informed pricing decision. Furthermore, even if the Airbnb host would have all the pricing data available as Airbnb has, a human being is probably not able to process such data as effectively as an AI based tool.

On the other hand, the Airbnb host needs to blindly rely on the "wisdom" of the pricing tool as (s)he has no means to evaluate beforehand the quality of the data the tool uses or the qualities of the tool itself. The larger the price range the Airbnb host sets, the greater the risk the host takes - on the other hand, the greater the income might be. Airbnb host remains largely in control over the pricing as (s)he has first of all the power to define the price limits and can set the tool on or off anytime. However, as long as the tool is on, the tool defines the price autonomously within the limits set beforehand.

It is still noteworthy that the Smart Pricing tool only concerns the negotiation of one, yet very essential, term of a contract: its price. In the future, similar tools could be developed to decide on other terms of the contract, too, such as delivery conditions, applicable law, dispute resolution method or the liability cap - or even on all the terms of a contract. For individuals the optimisation of contract terms is not necessarily too relevant or interesting. Instead, businesses aiming at the maximisation of their income might consider these kinds of tools very tempting.

2.1.3 Artificial intelligence reviewing contract terms

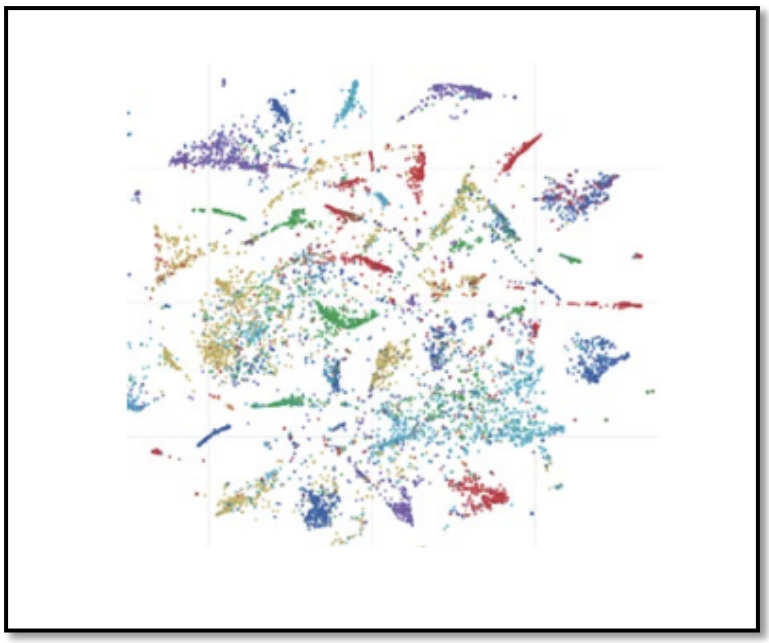
A company called Law Geex[59] has taught AI to review contract terms of various kinds. In February 2018 the company published a research report "Comparing the Performance of Artificial Intelligence to Human Lawyers in the Review of Standard Business Contracts". In the study, lawyers from the United States and an AI contract review automation solution developed by Law Geex, were put in competition with each other to spot for legal issues in five standard non-disclosure agreements ("NDA").

Before the test took place, Law Geex's AI had been taught by tens of thousands NDAs and other kinds of contracts including software agreements, service agreements and purchase orders.[60] The NDAs chosen for the research were publicly available and new to the AI tool. The teaching process of the AI is described as follows:

[59] See the company's website www.lawgeex.com (last visited 20 April 2020).
[60] LawGeex 2018, 11.

"The LawGeex AI was trained on tens of thousands of NDAs, using custom-built machine learning and deep learning technology. The machine was trained based on an exclusive corpus of documents that presented the LawGeex algorithm with a variety of examples, which allowed it to distinguish between different legal concepts.

This level of technology for analyzing legal documents has only been possible with advances in computing over the last five years. Computers convert the text into a numeric representation. The image below is a visualization of how computers read text. Each dot represents one paragraph in the semantic space. The different colors shown represent different legal issues. Pink dots, for example, represent samples of non-compete issues, and purple ones represent governing law sections."[61]



The picture is included in the report LawGeex 2018, 11.

In the report it is noted that the legal language poses some extra challenges compared to other types of natural language processing by AI. First, legal language is typically more complex and counterintuitive and therefore the existing computational language models

[61] LawGeex 2018, 11.

were inadequate. In addition, for the analysis to be useful from a legal point of view, it needs to be of higher accuracy than in case of other types of text analyses.[62]

According to the results, the AI developed by Law Geex achieved an accuracy rate of 94% on average whereas the lawyers received 85% on average. Importantly, AI concluded the process of reviewing five NDAs in only 26 seconds, whereas a human lawyer's speed was ranging between 51 to 156 minutes.[63]

The objectivity of the report naturally needs to be questioned as it is produced by a company and not an independent body. However, in the report it is noted that the research was overseen by an independent consultant and lawyer.[64]

In the above research the AI was only pointing out the legal issues but not making any suggestions how to overcome said issues. Such tool is thus not yet ready to replace a lawyer as such but to speed up the contract review process in helping the lawyer to focus on the most high-risk parts of the contract. Also other companies, such as Klarity Intelligence, Inc. are marketing similar AI tools for contract reviewing.[65]

2.1.4 High-frequency trading

High-frequency trading ("HFT") is a more radical example of contracting with the help of AI technology. HFT is a trading practice used on stock markets. In HFT highly sophisticated algorithms are used to analyse large sets of data, and based on said data, to autonomously execute orders on the stock exchange at ultra-high speed (the timeframe concerned is milliseconds or even shorter frequencies) and at large volumes.[66] Due to the ultra-high speed and complexity of the algorithms it is unlikely that the company or individual employing a HFT algorithm could monitor in real time the actions of the trading algorithm, e.g. what kind of orders the algorithm chooses to place and how many. It follows that in HFT the contracting seems to be "outsourced" to an intelligent agent: the trading algorithm.[67] AI seems to take a much more autonomous role in the contract

[62] *Ibid.,* 12.
[63] *Ibid.,* 14.
[64] *Ibid.,* 2.
[65] See the company's website https://www.tryklarity.com/ (last visited 20 April 2020). A promotion video demonstrating the functioning of Klarity's AI tool is available at https://www.tekniikkatalous.fi/uutiset/sovelluksemme-purkaa-sopimuksia-kuin-ihmislakimies-katso-esitys-ai-monday-tapahtumasta/ff68f5f0-af27-4aed-840a-a349617af9ba (last visited 20 April 2020).
[66] See e.g. Kirilenko – Lo 2013.
[67] See a news article explaining how HFT works, Wohlner 2019.

formation process in HFT – when compared to Airbnb's Smart Pricing tool and AI based contract review tools.

2.1.5 Computable contracts

It seems that the "computability" of law currently triggers more and more discussion amongst the academia both in Europe and the United States.[68] The above given example of HFT can be seen as an example of "computable contracting" as suggested by Harry Surden in his article "Computable Contracts" (2012).[69] Surden suggests that for a contract to be regarded as "computable" it needs to possess two features:

> 1) the contract needs to be "data-oriented" meaning that one or several terms of the contract are expressed as data to enable computer analysis thereof[70], and
>
> 2) said term becomes computable if the system processing the term has the capacity to assess whether said term has been complied with[71].

Surden highlights that data-oriented computable contracts are to be distinguished from electronic contracting as they are not merely electronic, but they have been specifically designed to be understood by a computer – i.e. machine-readable. On the contrary, regular electronic contracts, such as browse-wrap contracts are drafted in natural language (e.g. in English) and primarily meant to be human-readable.[72]

Surden provides several examples of computable contract terms. First, certain financial contract terms, such as a payment term, could be formulated in machine-readable form. Such term would become computable if the machine processing said term is designed so that it obtains information from the accounting systems and can thereby independently analyse the compliance of the payment term.[73]

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[68] See e.g. the website of a workshop held on 13 December 2019 at the University of Cambridge entitled "Lex Ex Machina: A workshop on law's computability". Available at https://www.jesus.cam.ac.uk/events/lex-ex-machina-workshop-laws-computability (last visited 20 April 2020); the website of the CompuLaw research project funded by the European Union. Available at https://cordis.europa.eu/project/id/833647 (last visited 20 April 2020); the website of a recently introduced MIT Computational Law Report. Available at https://law.mit.edu/ (last visited 20 April 2020).
[69] Surden 2012, 694–695.
[70] *Ibid.,* 634.
[71] *Ibid.,* 635.
[72] *Ibid.,* 642.
[73] *Ibid.,* 659-661.

As a second example Surden uses a consumer license to stream movies online. License terms are often geographically limited. Surden suggests that the geographical scope of a streaming license could be formulated in computable manner so that the compliance with the geographical limitation is independently analysed by a machine that has access to information of the location of the end user's IP address.[74]

Surden's third example also relates to licence terms. In 2011 Stanford University had a Stanford Intellectual Property Exchange ("SIPX") pilot program that studied computable intellectual property licensing terms.[75] The purpose of SIPX was to enable copyright holders to outsource the controlling of compliance with complex license terms to automated computer systems. As an example, in order to reduce licensing fees, a licence to engineering journals could be limited to engineering students and academics only, instead of all university members. The computability of such term could mean that a computer system would automatically check that the end user requesting access to an engineering journal is enrolled in an engineering course.[76]

Also, so-called smart contracts have been heavily discussed in recent years amongst academia.[77] According to Investopedia[78] smart contracts are "self-executing contract(s) with the terms of the agreement between buyer and seller being directly written into lines of code. The code and the agreements contained therein exist across a distributed, decentralized blockchain network. The code controls the execution, and transactions are trackable and irreversible."[79] Also smart contracts seem to adhere to Surden's idea of computable contracts.

Surden importantly points out that computable contracting may appear in its ordinary form, but it may also take a more advanced form as *autonomous* computable contracting.[80] By autonomous computable contracting Surden means cases where "the computer systems *themselves* are engaging in contracting automatically, without human intervention"[81], yet

[74] *Ibid.,* 661-662.
[75] For more please see the website of the pilot program https://law.stanford.edu/projects/stanford-intellectual-property-exchange/ (last visited 20 April 2020).
[76] Surden 2012, 662–663.
[77] See e.g. Lauslahti – Mattila – Seppälä 2016.
[78] Investopedia is an online dictionary with emphasis on financial terms. Please see Ivestopedia's website https://www.investopedia.com (last visited 20 April 2020).
[79] Investopedia entry titled "Smart Contracts", last updated 8 October 2019. Available at https://www.investopedia.com/terms/s/smart-contracts.asp (last visited 20 April 2020).
[80] Surden 2012, 694–695.
[81] Surden 2012, 695,

"subject to predefined rules and constrictions"[82]. Securities trading and purchasing online advertisements are named as real life examples of autonomous computable trading.[83]

One might wonder, how do the above examples of computable contracts relate to AI. Based on the description provided in the beginning of this thesis of AI research, the underlying idea of research focusing on AI seems to be to study how a computer system could be taught to perform tasks that traditionally only seem to be possible for human beings, such as the conclusion of contracts. This is why the idea of studying the computability of contracts seems to suit well under the umbrella of discussing AI techniques for contract formation.

2.2 Some conclusions on contracting with the help of artificial intelligence (Illustrations 1 and 2)

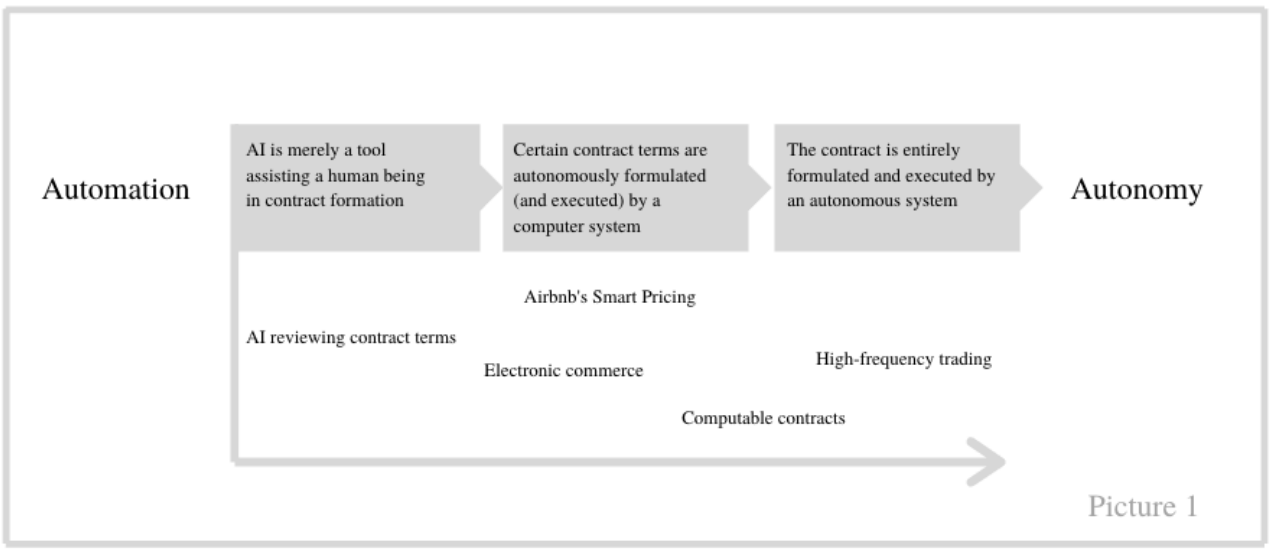
When analysing the use of AI in contract formation, it seems to be important to differentiate between *autonomy* and *automation*. When it comes to *automation*, it would always seem to require precisely formulated parameters that an intelligent agent merely executes. In other terms, automation does not seem to enable the intelligent agent to act discretionary.

On the other hand, the term *autonomous* seems to permit more independent action. An intelligent agent may have some autonomous features (such as adjusting the price subject to predefined price range), or it could be entirely free to define the price as well as other terms without any predefined parameters. Also, the more autonomous certain technology is, the more unpredictable it seems to become.[84]

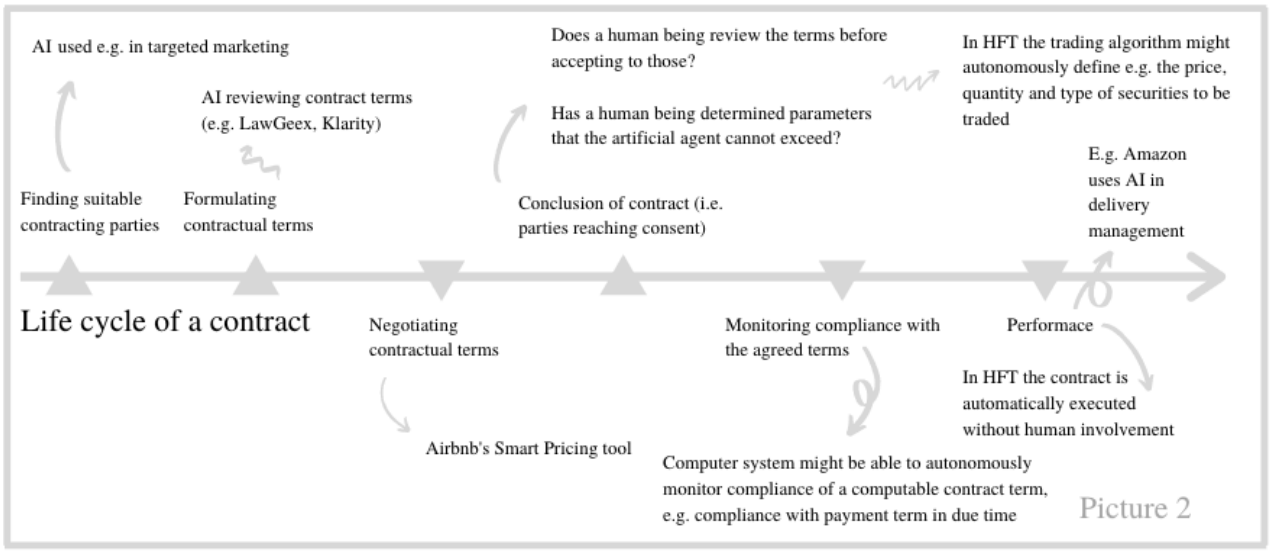
Before moving forward, it is still necessary to make some general conclusions on the above-described AI technologies used in contract formation.

[82] Surden 2012, 694–695.
[83] *Ibid.*
[84] Scholz 2017, 132.

Illustration 1, the AI technologies have been evaluated on the following basis: *how autonomous is the role of AI in the contracting process?*



In **Illustration 2** it is perceived *at what stages of contract formation process AI may potentially be used*.



Illustrations 1 and 2 are by no means exhaustive presentations of how AI is currently being used in contract formation but they are based on the observations made throughout the background research of this thesis. Their purpose is to illustrate the multiple roles AI may take in the contract formation process and furthermore, to facilitate the following discussion.

2.3 Electronic, digital or algorithmic contract?

Before discussing the applicable rules, it seems yet necessary to briefly stop by the concept of an electronic and/or digital contract. Nurmi has discussed comprehensively the definition of electronic contracting in the context of Finnish contract law in his work ”Elektroninen sopimus” (in english ”electronic contract”) published in 1997.[85] According to Nurmi electronic contracting means contracting with the help of modern telecommunication technology.[86] Nurmi illustrates electronic contracting by providing three examples:

1) In the first scenario, the contractual parties are actively involved in the contract formation; the parties themselves draft a human readable offer and acceptance that are electronically transmitted to each other, e.g. via email.
2) In the second scenario, one of the contractual parties is active in the contract formation process, whereas the other party is passive and provides its expression of intent electronically in accordance with beforehand programmed instructions.
3) In the third scenario, a contract is formed automatically by two computers without active involvement from the contracting parties.[87]

It is important to realise for the purposes of this thesis that, as the above presented three scenarious show, technology may play many kinds of roles in the formation of a contract. Furthermore, Nurmi’s scenarious are from 1997. In this thesis it has been suggested that possible contracting scenarios are today even more diverse.[88] Today, digital contracting may be perceived even more broadly: for instance, as the purchase of digital content or the conclusion of a contract between two autonomously (and not merely automatically) acting intelligent agents. Also so-called smart contracts, for instance, could be regarded by some as a subcategory of digital contracts.

In comparison, Scholz has more recently focused specifically on the definition of algorithmic contracts. According to Scholz, “algorithmic contracts are contracts that

[85] Please note that this work was published before the adoption of the Electronic Commerce Directive (2000/31/EC). When conducting background research for this thesis, no literature discussing electronic contracting after the adoption of the Electronic Commerce Directive, as comprehensively as in Nurmi’s work, was found.
[86] Nurmi 1997, 11.
[87] Nurmi 1997, 11.
[88] See Illustrations 1 and 2.

contain terms that were determined by algorithm rather than a person".[89] Scholz emphasises the importance of realising that the challenges of contract law differ depending on the role that the algorithm plays in contract formation. Scholz argues that, first of all, the distinction between "clear box" and "black box" algorithms seems crucial in this regard. The logic of clear box algorithms is detectable by humans whereas the logic of black box algorithms is not.[90]

In her article Scholz tries to create an entire taxonomy of algorithmic contracts. Scholz further divides algorithmic contracts into the following categories:

- The role of the algorithm (tool or agent)
- The task assigned to the algorithm (gap-filling or negotiation): Negotiation algorithms may be further divided into black box and clear box algorithms[91]

Interestingly, Scholz uses this taxonomy to analyse, to what extent an algorithmic contract present issues for contract law. Scholz concludes that actually only black box algorithmic contracts seem to be problematic in this regard.[92] According to Scholz, black box algorithmic contracts might potentially be held unenforceable, because they "inherently introduce a gap between the objectively manifested intent of the party using the algorithm and what the artificial agent does" as "black box algorithms by definition engage in emergent behavior that cannot be anticipated by a principal".[93]

Also, Lauslahti, Mattila and Seppälä raise a similar concern, in the context of Finnish law, in their article on the regulation of smart contracts. Even though the old contract law regime has been sufficient so far, the digitalisation of our society is currently so fast and new instruments are being created that are not necessarily adequately regulated by the current contractual rules. Lauslahti, Mattila and Seppälä argue that the currently arising new contractual instruments might be so far from the intention of the legislator that the traditional contractual rules may not be easily applied to them, not even by analogy.[94]

Later on in this thesis, when referring to electronically/digitally/algorithmically concluded contracts, as opposed to traditional oral and/or paper contracts, it has been chosen to

[89] Scholz 2017, 134.
[90] *Ibid.,* 135.
[91] *Ibid.,* 136.
[92] *Ibid.,* 136, 149.
[93] *Ibid.,* 136.
[94] Lauslahti – Mattila – Seppälä 2016, 25.

generally use the term ”digital contract”.[95] This is because the term ”digital” seems more common today when compared to ”electronic”. As an example, the term ”digital contract” is used in the recently adopted EU consumer protection directives in the context of which the term ”digital contracts” broadly encompasses purchasing of goods, digital content and digital services.[96] In this thesis, “digital contract” is thus used as a broad umbrella term to cover any kinds of contracts where digitalisation is involved (including AI and/or algorithmic contracts as defined by Scholz).

3. How has the Finnish legislator taken into account arising new contracting technologies?

3.1 A brief look at the history of regulating the formation of digital contracts in Finland

Now that some examples of the use of AI in contracting have beed presented, it is time to move on to the analysis: are the existing rules on the formation of contract sufficient when a contract is formed with the help of AI? Before diving into the analysis, it is first interesting to briefly look at how the legislator has previously tackled the regulation of new contracting techniques, in particular the rise of digital contracts.

The starting point in Finnish contract law is that the formation of digital contracts is regulated by the same principles of contract law as any other contracts, as the contractual parties are mostly free to agree on the form of the contract (e.g. oral, written or digital form).[97]

In a committee memorandum of the Ministry of Justice published in 1990 it was discussed whether the new data transfer tecnhologies might impose a need to update the Contracts Act (in Finnish “laki varallisuusoikeudellisista oikeustoimista”, 228/1929).[98] The committee analysed in particular the following contractual aspects in the light of new data transfer technologies: the formation of contracts, the place of contract, contracting with a

[95] The term ”digital” was chosen instead of ”electronic” as the latter would seem to emphasize the electricity which does not necessarily always need to be the case.
[96] Directive (EU) 2019/770 of the European Parliament and of the Council of 20 May 2019 on certain aspects concerning contracts for the supply of digital content and digital services; Directive (EU) 2019/771 of the European Parliament and of the Council of 20 May 2019 on certain aspects concerning contracts for the sale of goods, amending Regulation (EU) 2017/2394 and Directive 2009/22/EC, and repealing Directive 1999/44/EC.
[97] See e.g. Saarnilehto – Annola 2018, 41–43; Innanen – Saarimäki 2012, 265.
[98] Committee memorandum of the Ministry of Justice, 1990:20, 34–78.

vending machine, the relation of contractual rights to the original contract document, formality requirements, contractual errors and some aspects of authorisation. The committee concluded that there seems to be no need to suggest amendments to Contracts Act because the new technologies have not introduced essentially new phenomena that could not be addressed by the rules of contract law in force at that time.[99]

However, at the turn of the century it seemed to be necessary to clarify the legal status of digital contracts. In Article 9 of Directive on electronic commerce (2000/31/EC, hereinafter the ”Electronic Commerce Directive”) it is stipulated that all member states of the European Union shall ensure that their legal system allows contracts to be concluded by electronic means. Furthermore, member states shall in particular ensure that the legal requirements applicable to the contractual process neither create obstacles for the use of electronic contracts nor result in such contracts being deprived of legal effectiveness and validity on account of their having been made by electronic means. However, certain types of contracts were exempted including contracts relating to selling immovable property, family law and the law of succession.

Kierkegaard has interestingly pointed out that in the explanatory notes of the proposal of the Electronic Commerce Directive it was specifically stated that EU member states should refrain from preventing the use of certain electronic systems such as intelligent electronic agents for making a contract but, for some reason, the final version does not include any reference to intelligent agents.[100] One remains curious, why the reference to intelligent agenst has been chosen to be left out in the final version of the Directive. Maybe twenty years ago, at the time of adoption of the Electronic Commerce Directive the idea of an intelligent contracting agent seemed too far-fetched. As the above provided examples on new contracting techniques show, today’s technology may take more and more autonomous role in the formation of contracts. Today, such reference would no longer seem excessivley far-fetched.

Also, Chopra and White have criticised that Article 9 ”neither posits a particular attribution rule nor specifically deals with the question of autonomous agents”.[101] By attribution rule Chopra and White mean a rule clarifying that the manifestations of assent issued by an artificial agent acting automatically are attributed to the programmer of the agent or other

[99] Ibid., 76–78.
[100] Kierkegaard 2007, 42.
[101] Chopra – White 2011, 63.

principal of the agent.[102] Chopra and White further note that many EU member states have ended up implementing Article 9 by simply including a horizontal clause confirming that contracts concluded by electronic means shall be similarly valid as traditional non-electronic contracts.[103]

In line with Chopra and White's observation, in Finland the obligation of Article 9 of the Electronic Commerce Directive was implemented by inlcuding a clarification in the Act on provision of information society services (in Finnish "sähkökauppalaki" 458/2002, hereinafter the "Information Society Services Act"). In the preparatory work of the act it is noted that, except for certain contract types, the main principle in Finnish law is that the parties can choose in which form they want to conclude the contract and therefore there is no general obstacle to the validity of a contract concluded in electronic form.[104] However, certain contract types, such as rental agreement of immovable property and consumer credit contract, need to be concluded in written form e.g. for evidentiary purposes.[105] In addition to the requirement of written form, the validity of certain types of contracts might require notarisation, as in the case of selling immovable property[106], or the enrollment of the contract in a public registry, as in the case of prenuptial agreements[107].

In the preparatory work it is further noted that even before the implementation of the Eletronic Commerce Directive, the validity of electronically concluded contracts were equated to written contracts in certain special legislation provided that 1) it is not possible to unilaterally alter the contractual terms and 2) that the terms remain available to the contractors despite their electronic form.[108] It is however noted that, despite the special legislation in this regard, the law seems unclear with regard to on what conditions an electronic contract may be equated to a traditional written contract and this is why a general clause seems to be necessary in order to properly implement Article 9 of the Electronic Commerce Directive.[109]

The clarification was included in Section 12 of the implementing Information Society Services Act. The first paragraph of Section 12 provides that if a contract must be

[102] *Ibid.,* 61; As an example, see article 13(2)(b) of the UNCITRAL Model Law on Electronic Commerce of 1996 concerning the attribution of data messages.
[103] Chopra – White 2011, 63.
[104] Government proposal 194/2001 vp, 12.
[105] *Ibid.*
[106] See section 1 of Code of Real Estate (540/1995) in Finnish "Maakaari".
[107] See section 43 of Marriage Act (234/1929) in Finnish "Avioliittolaki".
[108] Government proposal 194/2001 vp, 12–13.
[109] Government proposal 194/2001 vp, 16.

concluded in writing according to the law, this requirement is also met by an electronic contract with contents that cannot be unilaterally altered, and which remain accessible to the parties. If a contract must be signed according to the law, the separate provisions on electronic signatures shall be applied. The provisions of said Section shall correspondingly apply to notifications and other measures by the parties relating to the contractual relation which according to the law must be in writing or signed. In the preparatory work it is noted that, as an example, a contract concluded via email and signed electronically so that its contents cannot be unilaterally changed is an electronic contract in the meaning of the Information Society Services Act. In the preparatory work of the act it is noted that the requiements of the act were not fulfilled, for instance, if contractual terms are available at a website but they may be unilaterally altered by the website administrator.[110]

According to the second paragraph of Section 12, if a notification relating to a contract must be supplied verifiably according to the law, this requirement may also be met by such an electronic method with which it can be demonstrated that the recipient has received the notification. An example of such notification provided in the preparatory work, is en electronic note of reception reinforced with adequate electronic signature.[111] In the third paragraph it is noted that paragraphs 1 and 2 shall not be applied to a contract concerning a property deal or any other transfer of a property or a contract relating to family or estate law, such as prenuptian agreements or deeds of partition.

In 2014 the Information Society Services Act was annulled and replaced by the Information Society Code (in Finnish "tietoyhteiskuntakaari", 917/2014). In the preparatory work of the Information Society Code it is noted that almost no case law existed on the interpretation of the Information Society Services Act.[112] The purpose of the introduction of the Information Society Code was to collect the essential rules on electronic communication and the provision of information society services in one act.[113] Section 12 of the Information Society Services Act has been included unamended in Section 181 of the Information Society Code.[114] Even though almost fifteen years had passed from the introduction of the Electronic Commerce Directive and digital contracting techniques had surely evolved, there seemed to be no need to review the adequacy of the general provision on digital contract formation.

[110] Government proposal 194/2001 vp, 39.
[111] *Ibid.*
[112] Government proposal 221/2013 vp, 18.
[113] *Ibid.*, 7.
[114] *Ibid.,* 167.

In conclusion, it seems that the specific rules on formation of digital contracts focus on establishing that the digital form does not, as such, cause a contract to be ineffetive. It is questionable whether this kind of generalised clause adequately addresses the special features that a digital contract may today possess, for instance, that the contract terms may be autonomously negotiated by an intelligent agent. For comparison, below it will be briefly presented, how the formation of digital contracts has been dealt with in the UNCITRAL Model Law on Electronic Commerce (1996) and in the more recent United Nations Convention on the Use of Electronic Communications in International Contracting (2005).

3.2 UNCITRAL Model Law and UN Convention on electronic commerce

Before moving forward it is still interesting to introduce two international soft law instruments addressing the regulation of digital contracts. It is not possible to discuss these instruments extensively, but some relevant clauses for the topic of this thesis will be concisely presented.

First, *UNCITRAL Model Law on Electronic Commerce* was introduced in 1996. Its objective is to enable and facilitate electronic commerce and to provide equal treatment to both paper-based and computer-based contracting in order to foster economy and international trade.[115] It provides a set of rules on electronic commerce to guide national legislators in adjusting national laws to the needs of newly arising technologies, in particular electronic mail, electronic data interchange (often referred as "EDI") and other modern communication techniques.[116] UNCITRAL Model Law is not a binding instrument, but it may serve as inspiration for national legislators.

UNCITRAL Model Law contains a similar general rule on digital contracts as contained in Article 9 of the Electronic Commerce Directive, yet formulated slightly more in detail. According to Article 11, "contract shall not be denied validity or enforceability on the sole ground that a data message was used for that purpose". Furthermore, in Article 12 it is added that "a declaration of will or other statement shall not be denied legal effect, validity or enforceability solely on the grounds that it is in the form of a data message". Furthermore it is described that "data message" is not limited to communication between

[115] UNCITRAL Model Law on Electronic Commerce with Guide to Enactment 1996, 16–17.
[116] *Ibid.,* 15–16, 64.

the contracting parties, but is also intended to encompass computer-generated records that are not intended for communication.[117] In comparison, Electronic Commerce Directive refers in very generalised manner to "electronic means" or "electronic contracts".

Article 13 contains detailed rules on the attribution of data messages to their originator through some concrete illustrations. It is noted that modern communication techniques are used in a context of legal uncertainty and as there was no specific legislation in most countries at the time of adoption of the UNCITRAL Model Law, it seemed necessary not only to establish the general principle that the use of electronic communication should not be discriminated against, but also to include specific illustrations of that principle in Article 13.[118] As an example, "a data message is deemed to be that of the originator if it was sent by an information system programmed by, or on behalf of, the originator to operate automatically". However, UNCITRAL Model Law is silent on situations in which the system would operate *autonomously*.

Second, *United Nations Convention on the Use of Electronic Communications in International Contracts* ("UN Convention") from 2005 is a more recent soft law instrument on digital contracting. The purpose of UN Convention, similarly to the UNCITRAL Model Law, is to facilitate the use of electroni communication in internation trade, to assure that contracts concluded and other communications exchanged electronically are as valid and enforceable as their traditional paper-based equivalents, and to update some aspects of UNCITRAL Model Law.[119] The instrument is non-binding, as no member states of the European Union have currently ratified it.[120]

UN Convention includes several interesting clauses. For instance, the term "automated message system" has been defined in detail in Article 4 as "a computer program or an electronic or other automated means used to initiate an action or respond to data messages or performances in whole or in part, without review or intervention by a natural person each time an action is initiated or a response is generated by the system". Furthermore, according to Article 12, "a contract formed by the interaction of an automated message

[117] UNCITRAL Model Law on Electronic Commerce with Guide to Enactment 1996, 26.
[118] *Ibid.,* 48.
[119] United Nations Convention on the Use of Electronic Communications in International Contracts with Explanatory Note 2005, 13–14.
[120] The ratification status of UN Convention can be checked United Nations website. Available at https://treaties.un.org/Pages/ViewDetails.aspx?src=TREATY&mtdsg_no=X-18&chapter=10&clang=_en (last visited 20 April 2020).

system and a natural person, or by the interaction of automated message systems, shall not be denied validity or enforceability on the sole ground that no natural person reviewed or intervened in each of the individual actions carried out by the automated message systems or the resulting contract".

Similarly as in UNCITRAL Model Law, UN Convention only addresses automation (not *autonomy*). However, in UN Convention it is explicitly recognised that a natural person might not be involved in all parts of the contracting process ("in each of the individual actions") and this should not *per se* render the contract unenforceable. For instance in high-frequency trading the role of a natural person is minimal or only formal. An interesting remark has been made in the explanatory notes:

> "At present, the attribution of actions of automated message systems to a person or legal entity is based on the paradigm that an automated message system is capable of performing only within the technical structures of its preset programming. However, at least in theory it is conceivable that future generations of automated information systems may be created with the ability to act autonomously and not just automatically. That is, through developments in artificial intelligence, a computer may be able to learn through experience, modify the instructions in its own programs and even devise new instructions. (…) UNCITRAL also considered that, as a general principle, the person (whether a natural person or a legal entity) on whose behalf a computer was pro- grammed should ultimately be responsible for any message generated by the machine. Article 12 of the Electronic Communications Convention is an enabling provision and should not be misinterpreted as allowing for an automated message system or a computer to be made the subject of rights and obligations. Electronic communications that are generated automatically by message systems or computers without direct human intervention should be regarded as "originating" from the legal entity on behalf of which the message system or computer is operated."[121]

The above note seems to suggest that in case a system is acting autonomously, the question setting and the regulation needed might be different. The purpose of this thesis is to

[121] United Nations Convention on the Use of Electronic Communications in International Contracts with Explanatory Note 2005, 69–70.

evaluate, whether the autonomy of an intelligent agent used in contract formation might impose new challenges to contract law regime.

Anohter interesting clause is contained in Article 11 of UN Convention: "a proposal to conclude a contract made through one or more electronic communications which is not addressed to one or more specific parties, but is generally accessible to parties making use of information systems, including proposals that make use of interactive applications for the placement of orders through such information systems, is to be considered as an invitation to make offers, unless it clearly indicates the intention of the party making the proposal to be bound in case of acceptance".

The explanatory notes contain rather lenghthy reasoning for this:

> "the final consensus was that the potentially unlimited reach of the Internet called for caution in establishing the legal value of these "offers". It was found that attaching a presumption of binding intention to the use of interactive applications would be detrimental for sellers holding a limited stock of certain goods, if the seller were to be liable to fulfil all purchase orders received from a potentially unlimited number of buyers. In order to avert that risk, companies offering goods or services through a website that uses interactive applications enabling negotiation and immediate processing of purchase orders for goods or services frequently indicate in their websites that they are not bound by those offers. UNCITRAL felt that, if this was already the case in practice, the Convention should not reverse it."[122]
>
> "As a general rule, UNCITRAL considered that it would be unwise to presume that persons using interactive applications to make offers always intended to make bind- ing offers, because that presumption would not reflect the prevailing practice in the marketplace"[123]

Finally, UNCITRAL Model Law and UN Convention both rely on the principles of functional equivalence and technology neutrality.[124] According to the principle of functional equivalence, paper-based transactions and electronic transactions should be

[122] United Nations Convention on the Use of Electronic Communications in International Contracts with Explanatory Note 2005, 67.
[123] *Ibid.,* 68.
[124] *Ibid.,* 1.

treated equally.[125] On the other hand, technology neutrality means that none of the technologies is favored by law.[126]

4. Is the existing contract law regime sufficient?

4.1 Identifying potential problems with regard to contract formation with artificial intelligence

In the above, some past developments in the regulation of contract formation have been presented. It is now time to move on to analysing, whether the rules applicable to contract formation are sufficient with regard to AI based contracting technologies. As noted earlier, in the context of this thesis it is not possible to analyse all possible aspects of contract formation that might be problematic. Instead, the following subjects have been identified as particularly interesting for further analysis:

- Expression of intent
- Error of expression
- The concept of good faith
- Interpretation of a contract drafted by AI

Some essential characteristics of AI were presented in Chapter 1. Amongst other features, AI may be able to *learn and improve its skills*. For instance, an algorithm may be able to learn trading strategies, such as a more effective pricing model. For instance, the use of reinforcement learning technologies has provided some promising results where the AI has ended up performing a task surprisingly well, yet in an unexpected manner. What seems to distinguish AI based technologies from other technologies is that AI provides not only *automation* but *autonomy*, at least with regard to some specific tasks. AI is not only able to execute some pre-determined instructions (if X happens, execute Y), but AI based technology may be able to independently optimise its behaviour and therefore reach results that were not foreseeable beforehand.

In AI based contracting technologies the contracting parties, i.e. ultimately the human beings entering into a contract, seem to have a lesser role in the contract formation process. It seems that AI is starting to be able to perform some cognitive tasks that used to be attributed to human beings only, such as negotiation of contractual terms, pricing, or risk

[125] *Ibid.,* 27.
[126] *Ibid.,* 26.

assessment.[127] Interestingly, in the context of the rise of digital commerce and other new contracting technologies, the legislator has mostly regarded technology as a tool in the contract formation process, and not as an actor *per se*. In the following it will be, amongst others, questioned, whether such conclusion is still adequate.[128] Further, the above listed matters selected for further analysis are particularly interesting in this respect, as they seem to require human involvement; what are the consequences when the human involvement is decreased?

As noted in the introduction, the purpose of this thesis is to concretise the discussion around AI and contract formation. In the following, the sufficiency of selected rules will be tested by trying to apply the rules in the context of three example cases. The AI solutions in the selected example cases represent different levels of autonomy (see Illustration 1). As suggested in Illustration 1, some AI solutions only seem to be used as tools assisting a human being in the contract formation. Such solutions are obviously not obtaining an autonomous role in the contract formation process. On the other hand, in some cases certain terms of the contract may be autonomously formulated, and/or even executed by AI based solution. In such cases, AI solution performs at least some part(s) of the contract autonomously. In the most extreme case, the contract is entirely formulated and executed by an autonomously acting AI solution with practically no human involvement. The intention is thus to analyse, how the varying level of autonomy of the AI solution used, affects the application of the selected rules.

The example cases are the following AI based contracting techniques:

- Case 1: AI reviewing contract terms (see section 2.1.3)
- Case 2: Airbnb's Smart Pricing (see section 2.1.2)
- Case 3: High-frequency trading (see section 2.1.4)

4.1.1 Expression of intent

In international legal literature, many have raised the concern about the adequacy of the expression of intent in case the technology used in contract formation obtains an independent or even autonomous role.[129] As this matter has raised a lot of attention

[127] See Sartor 2009 on the attribution of cognitive characters to software agents.
[128] See Pagallo 2013, 98–99 arguing that the tool approach is flawed.
[129] Allen – Widdison 1996; Sartor 2009; Scholz 2017; Weitzenböck 2001; Bellia 2001; Fischer 1997; Lerouge 1999; Teubner 2018.

amongst the academia, it seems necessary to first describe some highlights of the discussion and reflect the discussion from the Finnish perspective, before going to the case analysis. Allen and Widdison discussed this in their article "Can Computers Make Contracts?" published already in 1996. Allen and Widdison emphasise that the arising computer systems are not only capable of operating automatically, but even autonomously.[130] By autonomous behaviour they mean the ability to learn through experience and modify their own behaviour.[131] Allen and Widdison consequently ask, from contract law perspective in particular, "if machines are capable of replicating, or at least mimicking, processes that are regarded as evidence of free will when performed by humans, what are, and ought to be, the legal consequences of this situation".[132] In the article the focus is on analysing American and English contract law regimes in this respect.[133]

Allen and Widdison come to the conclusion that a contract generated by an autonomous computer imposes difficulties from doctrinal point of view. It is difficult to establish the contractual intention, as the offer and acceptance of the contracting parties cannot be clearly identified.[134] Allen and Widdison come to the conclusion that "neither American nor English law, as they currently stand, would confer legal status on all computer-generated agreements".[135] As a solution they suggest that the doctrinal difficulties could be overcome by either 1) regarding the computer as a legal person or 2) regarding the computer as a mere machine.[136]

Conferring legal personhood to computers would obviously require legislative changes. When it comes to the second alternative, Allen and Widdison propose three ways to avoid the doctrinal difficulties:

> 1) The requirements of intentionality in contract making could be relaxed; it could be decided that it is not necessary to establish human intention in making of an offer or an acceptance, when computer-generated agreements are concerned,

[130] Allen – Widdison 1996, 26–27.
[131] *Ibid.*
[132] *Ibid.*, 27.
[133] *Ibid.*, 30.
[134] *Ibid.*, 31–34, 43–44.
[135] *Ibid.,* 52.
[136] *Ibid.,* 34–35.

2) It could be insisted that a computer-generated agreement would not be binding unless human intention could be identified at every stage in the formation of the agreement; computer would be merely a tool of communication, or

3) The involvement of the autonomous computer in contract making could be simply disregarded which would lead to denying the validity of agreements generated by autonomous computers.[137]

Also Sartor has discussed the expression of intent in his article "Cognitive automata and the law: electronic contracting and the intentionality of software agents" published in 2009. Sartor interestingly points out that intentionality may also be scattered amongst different actors of an organisation: "the entity viewed from the intentional stance can be a mixed subject, that is a combination of human, electronic, and organisational components".[138] As an example Sartor mentions a company engaged in electronic commerce. In electronic commerce, a software interacts with customers, a programmer has written and modifies the software when necessary, the company's employees adjust parameters to the software, and the managers of the company guide the programmers and employees in achieving certain objectives.[139] Even if the intention of the company is scattered amongst many actors, it pursues certain objectives.

In his article Sartor argues that, unlike other objects or tools, software agents are able to perform "cognitive processes not attributable to the user" and this distinction needs to be taken seriously from a legal perspective.[140] According to Sartor, contracts made by autonomous software agents should be regarded either 1) as not being accompanied by any relevant cognitive states and therefore as being "exchanges without agreement", or 2) it should be recognised that the cognitive states relating to the agreement are attributable to the software agent making the agreement and this might have an impinging effect on the underlying contract (e.g. when the software agent makes a mistake).[141]

The discussion in both Allen and Widdison's and Sartor's article remains however on rather superficial level as they are not providing concrete examples on autonomous

[137] Allen – Widdison 1996, 43–59.
[138] Sartor 2009, 264.
[139] *Ibid.*
[140] *Ibid.,* 273, 278.
[141] Sartor 2009, 279.

software agents. More recently, also Scholz has discussed the problems relating to intentionality in her article "Algorithmic Contracts" published in 2017. Scholz provides concrete examples on algorithmic contracts by creating a taxonomy of various types of algorithmic contracts.[142] As concrete examples of algorithmic contracts Scholz mentions high-frequency trading, online pricing and smart contracts (contracts based on block chain technology).[143] Scholz seems to be most concerned of the differences between various types of algorithmic contracts and whether the legal professionals are sufficiently aware of their differences in order to identify potential problems, in particular with regard to contracts formed by using black box algorithms:

> "In particular, smart contracts illustrate that in some cases, the algorithms used in contract formation do not reflect the considered, consciously anticipated choices of their corporate users. By contrast, dynamic pricing, at least in its most familiar forms, is straightforward gap-filling readily covered by current contract law. However, jurists and lawmakers ignore more complicated cases such as smart contracts and high frequency trading at their peril. Contract law will soon be forced to have as coherent an approach to these hard cases as the simple cases. While litigation over the enforceability of hard algorithmic contract cases is currently rare, this is only due to the presence of repeat players, the norm of industry-specific regulation in high frequency trading, and the extreme marginality of the smart contract-using community. Algorithmic contracting will spread to other areas of commerce, and when it does, breach of contract cases will create uncertainty when contracts are formed with black box algorithms."[144]

Scholz concludes in her article that black box algorithmic contracts are probably not enforceable at current contract law. She, amongst others, reasons that "in the case of black box algorithmic contracts, the choice to be bound itself is indeterminate, even if what is agreed upon is fixed. When what the algorithm will agree to cannot be determined at the time the company puts the algorithm into use, the company has not objectively manifested the intent to be bound at a sufficient level of specificity to form an enforceable

[142] Scholz 2017, 136.
[143] *Ibid*., 137.
[144] Scholz 2017, 137.

contract."[145] Scholz suggests that the adoption of so-called agency approach (regarding algorithms, software agents and other intelligent agents as "agents" in the meaning of agency law) could provide a solution to address the enforceability issue raised above.[146]

It should be noted that Allen and Widdison as well as Scholz are analysing the concept of intentionality from the common law perspective. Sartor, on the other hand, remains on rather theoretical level without going into the detailed analysis of the contractual rules of any specific jurisdiction. The purpose of this thesis is to provide a concrete analysis of the Finnish contractual rules and therefore it is time to move on to discussing contractual intentionality and the use of intelligent agents from the Finnish perspective: does establishing intention seem problematic also in the Finnish context?

As already noted above in Chapter 3.1, the formation of digital as well as other kinds of contracts is regulated by the general principles of contract law. Saarnilehto and Annola suggest that the generality of the principles is the key to their long life: they adapt to new circumstances.[147] The rules on formation of contracts are contained in the Contracts Act and they also apply to the formation of digital contracts.[148] Saarnilehto and Annola claim that the majority of problems relating to digitally formed contracts can be solved based on the existing contract law regime. It is noted that there are still some contracting types subject to specific formality requirements that cannot be fulfilled in digital environment, but the most common formality requirements of written form and signature can be digitally implemented.[149]

The most prominen rules on the formation of contracts are included in the first chapter of the Contracts Act. The starting point is that a contract is formed by one party issuing an offer and the other party accepting the offer.[150] Innanen and Saarimäki point out that a contract concluded online is not necessarily concluded in accordance with the offer and acceptance model of the Contracts Act.[151] According to Innanen and Saarimäki, it is typical for digital contracts that they are formed without a clear expression of intent.[152] Laine is also questioning what constitutes an offer and acceptance in online context. Laine

[145] *Ibid.,* 155.
[146] *Ibid.,* 164.
[147] Saarnilehto – Annola 2018, 43.
[148] *Ibid.*
[149] Saarnilehto – Annola 2018, 43, 54.
[150] Chapter 1 Section 1 of the Contracts Act
[151] Innanen – Saarimäki 2012, 267; see also Saarnilehto – Annola 2018, 43.
[152] Innanen – Saarimäki 2012, 267.

points out that the offer and acceptance mechanism is non-mandatory legislation and contract can also be formed in alternative manners. As an example, the parties could explicitly agree how and when the contract is formed or then the formation could be based on certain commercial practice.[153]

In case in digital contracting a clear expression of intent may be lacking, at what moment and based on what norms is a digital contract concluded? Some kind of expression of intent is a prerequisite for any legal act, including all contracts.[154] Laine has pointed out that the primary intetion was to define this in the Electronic Commerce Directive, but this turned out too demanding and this question was left in the discretion of national legislators.[155]

It could thus be concluded that in the Finnish context it is at least to some extent recognised that digital contracts do not typically contain a clear expression of intent. Innanen and Saarimäki specify that contracts concluded without a clear expression of intent are so-called ”silent contracts”, ”tacit” or ”implied contracts” (in Finnish ”hiljainen sopimus” or ”konkludenttinen sopimus”). In silent contracting, the parties are engaged in certain activity that shows that the parties have agreed on performing the activity. A silent contract may be based on certain established practice or manner between the parties.[156] Innanen and Saarimäki conclude that the minimum requirements for the conclusion of a contract are the consensus between the parties on both the contents of the contract and the willigness to be bound to it.[157]

Saarnilehto and Annola confirm that an expression of intent, being a prerequisite for any legal act, may be expressed in several manners.[158] It is described that an expression of intent may be explicit or implied (i.e. silent). According to Saarnilehto and Annola, a silent expression of intent means that the parties are factually acting in certain manner without explicitly expressing their intent to be bound to a legal act and the expression of intent is in such a case derived from the parties' behaviour.[159] Saarnilehto and Annola's example of a silent contract is where party A orders a good from party B and B immediately sends the

[153] Laine 2001, 228.
[154] Saarnilehto – Annola 2018, 8; Hemmo – Hoppu 2019, 3. Sopimusoikeuden normisto ja sopimusriskit > Tahdonilmaisu.
[155] Laine 2001, 227.
[156] Innanen – Saarimäki 2012, 267.
[157] *Ibid.*
[158] Saarnilehto – Annola 2018, 9–10.
[159] *Ibid.*

good to A, without explicitly accepting the order e.g. in the form of an order confirmation.[160]

Saarnilehto and Annola however point out that passive behaviour cannot be regarded as an expression of intent to be bound to a contract, except for certain particual circumstances (e.g. business practice; also certain special legislation provides that a party may become bound through remaining passive).[161]

Also according to Hemmo and Hoppu, the conclusion of a contract requires, at least, that the contractual parties reach a consensus on the change of certain legal state by issuing concurring expressions of intent.[162] Hemmo and Hoppu confirm that expression of intent may be issued in many ways; in writing, orally, silently and through certain behaviour, for instance.[163]

Hemmo and Hoppu define a silent expression of intent to be such where a person does not expressly state the intent (orally or in writing), but his/hers expression of intent may be deduced from his/hers behaviour. As an example, a person does not need to say ”I agree” but (s)he could validly agree to a contract by simply nodding affirmatively. On the contrary, if person A makes a verbal offer to person B and B remains silent, the silence would be regarded as a negative expression of intent.[164] Hemmo and Hoppu further emphasise the importance of both a contracting party's *intent* as well as his/hers *expression* of intent in the conclusion of legal acts, such as contracts.[165] Hemmo defines a legal act to be an expression of intent that a party issues in order to establish, modify, transfer or annul rights.[166] When a party issues such an expression of intent i.e. when (s)he announces in e.g. a letter or orally that (s)he intends to establish, modify, transfer or annul certain right(s), the respective legal state is changed on the condition that the person has expressed his/hers intent in accordance with law.[167] It seems to follow that in case the expression of intent is improperly issued, the respective legal state remains in *status quo*.

As noted above, intent may also be expressed through behaviour. In some cases certain behaviour is regarded as an expression of intent on the basis of common practice. As an

[160] *Ibid.*
[161] Saarnilehto and Annola 2018, 9–10.
[162] Hemmo – Hoppu 2019, 6. Sopimuksen tekeminen > Sopimuksen syntyminen > Tahdonilmaisut.
[163] *Ibid.*
[164] *Ibid*., 3. Sopimusoikeuden normisto ja sopimusriskit > Tahdonilmaisu > Kohdistaminen > Tahdonilmaisu liike-elämässä.
[165] *Ibid.,* 3. Sopimusoikeuden normisto ja sopimusriskit > Tahdonilmaisu.
[166] Hemmo – Hoppu 2019, 3. Sopimusoikeuden normisto ja sopimusriskit > Tahdonilmaisu.
[167] *Ibid.*

example Hemmo and Hoppu mention public transport.[168] One may assume that by hopping in a local bus the passenger agrees to comply with certain rules (e.g. paying for the bus ticket and not consuming alcohol in the bus). As another example Hemmo and Hoppu mention private parking lots subject to contractual penalty.

Private parking lots and the formation of contract were discussed in case 2010:23 decided by the Supreme Court of Finland. In the case the owner of a private parking lot had placed a sign at the entrance of the parking lot stating that parking is allowed only with the owner's permission and parking without a permission is subject to a fine of 40 euros. In the sign it was explicitly noted that by parking one accepts said terms. In the case it was discussed, whether a person, who has parked his car at the parking lot without a permission and has consequently receveid a fine, had by the act of parking his car, bound himself to a contract on the terms specified on the sign.

In the reasoning of the judgment it is noted that the offer and acceptance model of the Contracts Act may need to be adjusted to the needs of new circumstances or even so that the formation of contract is based on external factors such as behaviour as opposed to focusing purely on the subjective expression of intention. In such a case the following needs to be analysed: what kind of behaviour can objectively be regarded as a typical expression of intention to be bound to a contract in given circumstances.[169]

In the reasoning it is explicitly noted that contracts concluded with the help of technical devices, such as a vending machine, and simple and essentially similar contracts that are concluded on a daily basis and in large amounts (such as parking contracts as in the case at hand) are typical examples of contracts to which the analysis of the rules of the Contracts Act seems insufficient.[170]

The court found that the person had become bound to the terms of the sign by parking his car at the private parking lot. It was also noted that in the circumstances of the case this conclusion could not be regarded as surprising or exceptional as the parking terms were clearly stipulated on the sign and it is a common practice in city area that parking is subject to restrictions and fees.[171]

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[168] *Ibid.*, 6. Sopimuksen tekeminen > Sopimuksen syntyminen > Tahdonilmaisut.
[169] Paragraph 12.
[170] Paragraph 13.
[171] Paragraph 14, interestingly, Justices Rautio and Aarnio left a dissenting opinion on the judgment. They found that in the circumstances of the case, an implied or silent expression of intent would not be sufficient to establish a contractual relation between the parties. They found that parking fines are more typically issued by a public authority and therefore the acceptance of such an exceptional contractual penalty fee requires an explicit expression of intent.

It seems that in the light of this judgment, the Finnish approach to establishing an expression of intent is rather objective and focuses on the external factors (such as behaviour) instead of the internal state of mind of the contracting parties. Also, it seems that in case no clear expression of intent has been issued, it needs to be obvious and predictable that certain behaviour in given circumstances is going to be regarded as an expression of intent.

The Supreme Court has discussed the formation of silent contracts also in other contexts.[172] The Supreme Court has in several cases confirmed that, in addition to the offer and acceptance model, a contract can also be formed without explicit expressions of intent, i.e. through certain factual actions or behaviour of the parties. The prerequisite for establishing intention in such a way is that there is sufficiently materials available to proof that the parties had reached a consensus both on the bindingness of the contract as well as of the contents of the contract. The court has ephasised that one should be cautios with contracts formed without explicit expressions of intent in order to protect the the contractual parties from being bound to a contract that (s)he has not actually appoved.[173]

The case 2018:37 concerned the cooperation between a coffee company (C) and a company providing disposable cups (D). C had contacted D in order to initiate cooperation relating to manufacturing, storage and selling of paper cups. D had started to deliver paper cups to C, but the parties had not agreed on the terms of the cooperation in detail. After three years of cooperation, C informed D that they will no longer buy paper cups from D. D consequently claimed damages for the cups that they had storaged for C arguing that C had breached their contract by terminating the cooperation so suddenly. C, on the other hand, argued that there was no contract between the parties.

In the case the Supreme Court found that even if the detailed contents of the agreement could not be established (e.g. the exact starting date of the contract), a cooperation agreement had been formed between the parties that was to be regarded as being valid until further notice.[174] The court argued that in the case it was obvious that the parties had been in close cooperation with each other (e.g. C had permitted that D uses C's trademark for

[172] See e.g. cases 2018:37, 2012:86 (paragraph 5), 2011:21 (paragraph 4), 2011:6 (paragraphs 7 and 8) and 2006:71 (paragraph 16) of the Finnish Supreme Court.
[173] See cases 2018:37 (paragraph 6), 2006:71 (paragraph 16), 2010:23 (paragraph 12) and 2011:6 (paragraphs 7 and 8).
[174] Paragraph 10.

marketing purposes and C had provided guidance to D in the manifacturing of the paper cups), and therefore an agreement had been formed.[175]

On the other hand, in case 2006:71 the Supreme Court came to the conlcusion that certain cooperation between a company (X) and the Finnish state had not lead to the formation of a contract. The parties' cooperation concerned the protection of certain water area and the regulation of energy infrastucture in that area. In the case X claimed that it had entered into an agreement with the Finnish state in 1959 when X had made a proposal to the Finnish state that had consequently been approved by the state. X claimed that the Act on the Protection of Rapids (35/1987) passed several decades afterwards were in breach of the agreement and claimed for damages based on a contractual breach. The Finnish state claimed that it had merely issued an administrative decision that did lead to some obligations, but no agreement had been formed between the parties. In the case the court, amonghts others, argued that the term of the alleged agreement would have been exceptionally long. Therefore, it would have been necessary that its contents were clearly extablished and the parties should have somehow prepared for the likely changes in the circumstances that might occur during the long contractual term. Therefore the court did not accept X' claim of damages on the basis of a contractual breach.[176]

In conclusion, in the Finnish context it seems that it is well recognised that the expression of intent does not have to fall under the classical "offer and acceptance" model. Instead, it seems to be sufficient if the expression of intent may be objectively deduced from the behaviour of the contracting parties. Mäkelä has criticised that it is currently not very clear, what constitutes sufficient expression of intent and this unnecessarily fragmented regulatory environement may, amongst others, lead to legal uncertainty.[177]

Something that remains particularly unclear based on the foregoing litterature and case law is, how *precise* does the intetion have to be? Is it sufficient to express intention to sell goods X, Y and Z, if the price, quantity as well as the identity of the customers remains in the discretion of an autonomously acting intelligent agent? On the other hand, is it reasonable to assume the intention to be bound to any actions that an intelligent agent performs on behalf of its principal, in particular in case the actions of the agent cannot be predicted?

[175] Paragraph 10.
[176] Paragraph 16.
[177] Mäkelä 2008, 22.

Analysis

It is now time to move on to analysing the expression of intent by using the three example cases. The aspect to be analysed is, whether the use of AI based technology might affect the contracting party's formation of intent in such a manner that the intention cannot not be adequately established. In other words, is the role of the AI in the contract formation process so independent, that its activities cannot be regarded as being what the contracting party "intended"?

Case 1: AI reviewing contract terms

When it comes to AI technology used for reviewing contractual terms, it first seems obvious that the expression of intent does not form an issue. In Case 1, AI seems to be used only as a tool to help the contracting party to identify possible risks in the contractual terms – to help the contracting party to form his/her intention. AI does not obtain an independent role in the contract formation process and therefore it does not "break" the contractor's formation of intent. The contracting party (him)herself decides whether or not (s)he wants to bound (him)herself to the terms reviewed by the AI and if so, expresses his/her intent to the other contracting party.

Of course, the scenario could be different depending on how the AI based reviewing tool is used. Such tool could be used as an "extra eye" to help to spot possible issues, in addition to a review made by the contracting party. On the other hand, at least once AI based contract reviewing tools develop, they could also be used as the only means to go through the contractual terms. If the reviewing tool would not spot any risks, it could notify its principal that the terms are acceptable and the principal could consequently issue an affirmative expression of intent to the other contracting party. Depending on how the AI has been taught, it might be difficult to understand *ex post*, why the tool came to the conclusion that the terms are acceptable: the reviewing tool could be provided with strict parameters that the terms need to comply with (e.g. price, limitation of liability, terms of delivery, applicable law), or it could be left with discretion to assess the acceptability of a set of terms.

Particularly in the context of the latter scenario, the above raised question of the precision of the intention seems relevant: can one validly express intention to "whatever" terms or

should the expresser of the intention have at least some actual subjective intention to agree on the most essential terms (such as price or quantity, for instance)?

Case 2: Airbnb's Smart Pricing

In Smart Pricing one essential term, the price of the rental property, is left in the discretion of a pricing algorithm. The algorithm is however not entirely free, as the Airbnb host may determine the prince range beforehand (the host needs to define the maximum and minimum prices). Similarly as in Case 1, Smart Pricing also seems to be more of a tool for the host to maximise his/her income by adjusting the price to a proper level. Consequently, it seems that the use of AI based pricing tool does not have any effects on the formation of intent. Again, the conclusion could be different if the pricing algorithm could decide on more matters than only the price and if the algorithm would not be bound to certain parameters but it could freely decide on the terms.

Case 3: High-frequency trading

High-frequency trading differs quite strikingly from the above two examples. Trading strategies in high-frequency trading are not easily transparent to outsiders, but it may be assumed that the trading algorithm has broad discretion in deciding the details of the transactions: for instance, what is being bought/sold, at which price, in what quantity, and at what precise moment is the trade executed. Essentially, the algorithm is fed with data, and based on the data, the algorithm independently plans and executes a transaction at ultra-high speed. The company behind the algorithm "intends" to engage in the transactions but is the intention sufficiently precise, in case all the above listed details of the transactions are actually determined by the trading algorithm, and not its principal? Furthermore, it might be that the contracting party using the trading algorithm assumes that the algorithm will adopt certain kind of strategy. What if the algorithm, based on the data it has been fed with, comes to a very different conclusion than what was expected by its principal? Can the principal's intention be extended to any actions conducted by such algorithm?

As noted above, the rules on the formation of intention are not too precise in the Finnish context. In the light of the case 2010:23 of the Supreme Court, it seems that the question to be analysed in this kind of scenario be the following: is it obvious and predictable that the actions of the algorithm are, in the circumstances of the transaction, going to be attributable to the principal's expression of intent? The analysis always needs to be made

case by case. Maybe, in particular if the algorithm would act strikingly differently than what its principal assumed, the principal's intention could not be attributed to the algorithm's behaviour. On the otherhand, should not the principal be aware that the algorithm is AI based and therefore it may act unpredictably to human beings? Would not then the actions be merely surprising, but not unpredictable? One could thus also come to the conclusion that, by deciding to use the algorithm, one expresses the intention to be bound to any actions taken by the algorithm and thereby assumes the risk that it may act in an unpredictable manner.

As already noted above regarding Case 1, the essential question seems to be, whether one can validly express intention to be bound by *any* actions of the algorithm. In the light of the foregoing, it would seem that this might be possible. As a comparison, one could think here the legal act of issuing a power of attorney. It is possible that the scope of the power of attorney is left totally open or its scope is very generalised.[178]

Advertisements are treated as an invitation to treat – how about websites?

One specific aspect that is still interesting to be discussed is the role of websites in contract formation. Do the products/services and their prices set out on a website constitute a binding offer, or are they to be regarded as an advertisement? In case e.g. the price is for some reason too low, could the seller argue that it is not bound to the price announced on its website, as the website only constituted an advertisement, and not a binding offer?

The starting point in Finnish law is that advertisements (such as television advertisements, advertising leaflets and shop windows) are not regarded as a binding offer but as an action inviting other parties to make an offer to form a contract (often referred as "invitation to treat").[179] However, in some cases, e.g. in direct marketing, an advertisement could be regarded as a binding offer.[180]

Interestigly, as already noted in Section 3.2 above, Article 11 of the UN Convention specifically addresses this matter: "a proposal to conclude a contract made through one or more electronic communications which is not addressed to one or more specific parties, but is generally accessible to parties making use of information systems, including proposals that make use of interactive applications for the placement of orders through

[178] See e.g. Hemmo – Hoppu 2019, 5. Edustus > Tahdonvaltainen edustus > Valtuutus > Erilaisista valtuuttamistavoista > Valtakirjavaltuutus describing different types of letters of authorisation, including an open letter ("avoin valtakirja") and a general authorisation ("yleisvaltakirja").
[179] Hemmo – Hoppu 2019, 6. Sopimuksen tekeminen > Sopimuksen syntyminen > Muita sopimuksen syntymistapoja > Markkinoinnin aiheuttama tarjoussidonnaisuus.
[180] *Ibid.*

such information systems, is to be considered as an invitation to make offers, unless it clearly indicates the intention of the party making the proposal to be bound in case of acceptance". In the UN Convention, similarly as in the Finnish legal tradition, one decisive factor seems to be, whether the advertisement material is generally available or if it is customised and targeted to certain person(s), only.

In Airbnb and other contemporary online selling venues, it seems that AI is sometimes used to tailor the website individually to each customer of the website (e.g. through price optimisation or by targeting some content to certain customers specifically). The main submission in this thesis is that AI may be used in numerous ways in contract formation and therefore each case should be individually analysed. However, in case a website has been individualised to each customer's preferences, it might be difficult for the seller to argue that its website was only an advertisement (and not a binding offer). The seller could also try to be freed from being bound to the price announced on its website, by relying on the rules of error of expression. The rules on error of expression will be discussed more in detail in Section 4.1.2.

Lastly, when it comes to consumer contracts, the Finnish Consumer Ombudsman is strongly of the opinion that an online advertisement is binding on the seller.[181] However, in online contracting, the applicable law is not always Finnish law. Many aspects in consumer law have been harmonised by the European Union, but the rules on formation of contracts remain largely unaffected. Consumers do make more an more purchases from sellers established outside Finland or the European Union. It follows that in some cases the consumer might end up being negatively surprised.

Conclusion

The Finnish rules on the expression of intent are not crystal clear, but they seem to provide sufficiently flexible tools to analyse the expression of intent when an autonomously acting intelligent agent has been used in contract formation. In conclusion, in the Finnish context it seems that it would be difficult to argue that the use of autonomously acting intelligent agent in contract formation would hinder the adequate formation of contractual intent.

[181] See the website of the Finnish Consumer Ombudsman https://www.kkv.fi/ratkaisut-ja-julkaisut/julkaisut/kuluttaja-asiamiehen-linjaukset/aihekohtaiset/markkinoinnin-virhetilanteet/ (last visited 20 April 2020).

4.1.2 Error of expression

In the previous section it was concluded that it is likely that the actions of the intelligent agent throughout the contract formation process are to be regarded as "intended" by the principal of the agent. What if the intelligent agent acts differently than the principal assumed or, purely subjectively, intended? Closely related to the above discussion on expression of intent, it is also interesting to analyse, how the rules concerning the error of expression, contained in Article 32 of the Contracts Act, would behave in the three example case scenarios.

As noted earlier in Chapter 1.1.1, AI has not yet received the level of being generally intelligent (sometimes referred as singularity), but it may be able to perform some rather specific tasks intelligently. Furthermore, AI may have some understanding of the context where it operates (see e.g. the examples provided on reinforcement learning), but the "understanding" of AI is not likely to be identical to the human understanding of the context. Therefore, the intelligent agent might well act in some situations or contexts differently than what its principal assumed or predicted.

For example, in some car parks the parking fee is automatically charged based on data received through image recognition technology. When driving into and leaving the car park, an intelligent agent linked to a camera recognises the movements of a specific car based on its registration number and automatically charges the parking fee from an account linked to the registration number. Typically this kind of system requires online subscription to the car park beforehand. Mistakes might occur if the number plate is covered by snow or mud, for instance. The system could also be misled in case of foreign registration numbers, if the image recognition agent is only taught based on images of Finnish registration numbers. Or, in some cases, there might be several companies providing parking services in one car park. In Finland in some car parks there are both private parking companies and a communal transportation company providing parking services in the same parking space. The parking service provider has probably taken these aspects into consideration beforehand, but it is not out ruled that in some circumstances the intelligent agent could make a mistake.

Already such a simple application includes several possible aspects that might go wrong and lead to erroneous expressions of contractual intent. In the context of more complex contracting environments, the possibility of errors seems endless. Therefore, it seems relevant to analyse the applicability of the rules on error of expression more thoroughly from the perspective of the three example cases.

Before moving forward, one could still critically ask, is not the possibility of errors endless in any kind of complex contracting environment (no matter if an intelligent agent is involved): why is it necessary to analyse this matter in particular from the perspective of intelligent agents? In this thesis it will be suggested that the possible errors when using an intelligent agent might be different and more difficult to predict than the "classical" contractual errors, such as misprinting the price or number of goods, or clicking wrong box on a website. AI functions on the basis of the data that it has been taught with and therefore it is as good as its learning data. It seems that by making use of AI, the principal assumes that the intelligent agent will come to a rational outcome (hopefully more efficiently than its principal) and therefore enables the intelligent agent to act autonomously on the principal's behalf. Therefore, it can be questioned, whether AI actually ever makes mistakes – or merely acts in a way that its principle could not foresee? Of course a "normal" mistake could be at hand in case the AI based software includes a bug, but the following analysis will focus on the scenario that the intelligent agent is acting as it should be but it simply comes to an unpredictable conclusion for the human brain – are the rules contained in Section 32 of the Contracts Act adequate to regulate such scenarios?

In the Finnish contract law tradition a threefold (or sometimes even fourfold) distinction has been made between different types of errors:

1. error of expression (in Finnish: "ilmaisuerehdys"),
2. error in transmitting the expression (in Finnish "välitysvirhe"),
3. erroneous motive (in Finnish "motiivierehdys"), and
4. erroneous perception of the legal state (in Finnish "oikeuserehdys").[182]

Section 32 of the Contracts Act regulates both error of expression (first paragraph of Section 32) and error in transmitting the expression (second paragraph of Section 32). According to the first paragraph of Section 32 of the Contracts Act, where a message containing an expression of a person's will, due to a misprint or other error on his/her part, differs from what he/she intended, the message shall not bind him/her if the recipient knew or should have known of the misprint or error. The second paragraph of Section 32 first seems to be more relevant in the context of digital contracting where contractual messages are typically transmitted indirectly, e.g. via information technology: where a message

[182] Hemmo – Hoppu 2019, 6. Sopimuksen tekeminen > Sopimuksen pätemättömyys > Pätemättömyysperusteet > Tahdon ja sen ilmaisun poikkeaminen toisistaan > Ilmaisuerehdys; Mäkelä 2010, 146–163.

containing an expression of a person's will is transmitted by electronic means or orally through a messenger and it changes due to an error in transmission or a mistake made in its delivery by the messenger, the message shall not bind the sender in the form in which it reached the other party even if the recipient was in good faith. After learning of the change the sender shall, however, inform the recipient without undue delay that he/she does not want to be bound by the changed message; otherwise, and provided that the recipient was in good faith, the message shall be binding in the form it reached the recipient.

Erroneous expression of intent is not binding in case the recipient of the expression knew or should have known that the expression was erroneously issued. In other words, in case the recipient of the erroneous expression was not aware of the error therein, such expression is binding upon its issuer. A typical example of error of expression is a spelling mistake (e.g. the price of the product is accidentally written to be lower in the offer document, than intended). In which kind of circumstances could it be argued that the recipient should have known of the error in the expression of intent? According to Hemmo and Hoppu, this could be the case if the price in the offer is remarkably lower than the market price and there seems to be no meaningful reason for such behaviour.[183]

Nurmi has interestingly pointed out that Section 32.1 requires 1) the identification of the objectively observable contents of the expression of intent and that needs to be compared to 2) the actual intention of the person who issued the erroneous expression.[184] Nurmi is concerned that in fully automated contracting environment where no human being has issued a concrete expression of intent but a computer is acting on behalf of the contractual party, the identification of the two elements might not be possible. Nurmi further notes that the wording of Section 32.1 is written so, that it specifically requires that the error is caused by the person issuing his/her expression of intent (in Finnish "hänen erehdyksensä"). Therefore, Section 32.1 is hardly applicable in case the error is actually caused by a computer.[185] Nurmi however comes to the conclusion that the person using a computer is responsible for its functioning and should also bear the risk that it might end up issuing an erroneous message (e.g. due to a malfunction or poor programming).[186] Nurmi argues that only unreasonable legal consequences of an error could be prevented by

[183] Hemmo – Hoppu 2019, 6. Sopimuksen tekeminen > Sopimuksen pätemättömyys > Pätemättömyysperusteet > Tahdon ja sen ilmaisun poikkeaminen toisistaan > Ilmaisuerehdys.
[184] Nurmi 1997, 57–58.
[185] Nurmi 1997, 58, see footnote 128.
[186] Nurmi 1997, 58–59.

applying Section 36 of the Contracts Act.[187] Otherwise, in case the computer is automatically in charge or issuing and responding to contractual expressions, the principal is bound to the actions of the computer, even if they were not what the principal intended.[188]

Mäkelä has noted that specific rules have been adopted in order to avoid errors in the digital contracting environment.[189] According to Section 177 of the Information Society Code, the information society service providers shall, before recipients of the service place an order, have available to them clear and easy to understand information on technical means that may be used to identify and correct errors of entry before placing an order.

Error in transmitting the expression, on the other hand, means that the expression of intent has been generated as intended, but the expression is erroneously altered during its transmission to its recipient. According to the second paragraph, of Section 32, in case of error in transmitting the expression of intention, the changed expression is not binding, even if the recipient of the expression was in good faith. This paragraph only concerns situations where the message is transmitted "by electronic means" (in Finnish referred as "sähköteitse" or "sähköttämisessä") or "orally through a messenger". The Finnish word "sähköttämisessä" refers specifically to sending telegrams. It has been concluded that the second paragraph is not applicable to modern data transfer technologies (such as email), because in such technologies there is no intermediary, but the message is transferred directly from the sender to the recipient: the applicability of the provision requires that the error is caused by a third party.[190] It follows that this provision is no longer considered very relevant.[191]

Without going into details, if one focuses on the distribution of risk between the sender and recipient of the erroneous contractual expression, there is a remarkable theoretical difference between paragraphs one and two of Section 32. First paragraph seems to principally protect the recipient's entitlement to rely on the accuracy of the received expression (in the spirit of the reliance theory[192]). The second paragraph, on the other,

[187] According to Section 36, in case the application of a contract term would lead to an unfair result, the term may be adjusted of set aside.
[188] Nurmi 1997, 58–59, Nurmi refers to case 1990:30 of the Supreme Court. For more recent case law on error of expression, see cases 2016:8 and 2008:57 of the Supreme Court.
[189] Mäkelä 2010, 148, refers to Section 10(2) of Information Society Services Act (similar provision is currently included in Section 177 of the Information Society Code).
[190] Committee memorandum of the Ministry of Justice 1990:20, 222–223; Mäkelä 2010, 152; Nurmi 1997, 59–70 is thoroughly discussing the applicability of the second paragraph of Section 32 of Contracts Act to modern data transfer technologies.
[191] Mäkelä 2010, 152.
[192] See e.g. Mäkelä 2010, 43, referring to af Hällström 1931.

seems to protect the actual intent of the party issuing a contractual expression (in the spirit of the will theory[193]).[194] The Finnish contract law regime is traditionally closer to the reliance theory than the will theory – as also indicated by the several provisions referring to the requirement of good faith in the Contracts Act.[195]

Erroneous motive means that the intention and the related expression do match, but the person issuing the expression has mistaken about the facts on the basis of which (s)he has formed the intention.[196] As an example Hemmo and Hoppu mention mistakes in calculation: if a company makes a mistake in evaluating the expenses of a customer project and therefore places an order with underrated price, the company's motive to set the price is erroneous.

The regulation of erroneous motive has intentionally be left out from the Contracts Act and is therefore to be decided case by case.[197] The starting point is that the motive, e.g. why a party decides to enter into a contract for defined terms, is irrelevant for law.[198] In other words, even if the motive of a contracting party is erroneous, the party remains bound to his/her expression of intent. The only exception to this seems to be, in case the other contracting party's behaviour would fall under Section 33 of the Contracts Act.[199] According to Section 33, a contract shall not be enforceable if it was entered into under circumstances that would make it incompatible with honour and good faith for anyone knowing of those circumstances and the person to whom the contract was directed must be presumed to have known of the circumstances.

The last type of errors, *erroneous perception of the legal state*, can also be regarded as a subcategory of the cases of erroneous motive. It is neither regulated by codified law, but remains subject to case law and legal literature, only.[200] The starting point, in line with the roman law based notion of *ignorantia iuris nocet,* is that each party should know the law

[193] See e.g. Mäkelä 2010, 45, referring to von Savigny 1851–53.
[194] For a lengthier discussion around the distribution of risk and the rules on contractual errors see e.g. Nurmi 1997, 55–71.
[195] Mäkelä 2010, 46.
[196] Hemmo – Hoppu 2019, 6. Sopimuksen tekeminen > Sopimuksen pätemättömyys > Pätemättömyysperusteet > Tahdon ja sen ilmaisun poikkeaminen toisistaan > Ilmaisuerehdys.
[197] Mäkelä 2010, 152; see e.g. case 2008:57 of the Supreme Court.
[198] Hemmo – Hoppu 2019, 6. Sopimuksen tekeminen > Sopimuksen pätemättömyys > Pätemättömyysperusteet > Tahdon ja sen ilmaisun poikkeaminen toisistaan > Ilmaisuerehdys.
[199] Ibid.; Mäkelä 2010, 152–153.
[200] Mäkelä 2010, 160.

and unawareness is no excuse for escaping the binding effect of a contract.[201] Mäkelä is however suggesting that this strict interpretation might gradually be about to loosen.[202]

Analysis

It is now time to move to analysing the above-presented rules on contractual errors in the context of the concrete case examples. The focus thus lies on analysing the legal consequences if the intelligent agent acts otherwise than what its principal intended.

Case 1: AI reviewing contract terms

In the first case example, AI is used as a *tool*: AI reviews the contractual rules on behalf of the principal. The principal remains the contractual *actor* and ultimately expresses the intention to be bound to the reviewed rules. Consequently, it seems that the use of AI in this context, would not impose challenges to the applicability of Section 32 of Contracts Act (concerning 1. and 2. types of contractual errors). Possible errors are to be analysed similarly as in any other contracting environment.

However, when it comes to erroneous motive and erroneous perception of legal state, it seems that the use of AI reviewing tools might increase the likelihood of these types of errors. The logic of the functioning of AI remains at least to some level unpredictable to its principal. As an example, AI could somewhat surprisingly come to a conclusion that there is no need to include a limitation of liability clause in a contract, e.g. for the sake of saving time in contract negotiations. Typically businesses however require, that their liability is limited. In case the principal does not cross-check the contract, but "blindly" relies on the review conducted by the AI, the fact that the limitation of liability is missing might go unnoticed. In such a case, the principal might erroneously assume that the liability is limited and therefore enter into the agreement with erroneous motive in that respect.

As noted above, there are no codified rules on erroneous motive but the starting point established in case law and legal literature is that one cannot avoid a contract by relying on error in motive. Only Section 33 of Contracts Act might provide a ground to be freed from contractual liability in case of erroneous motive. Analysing such scenarios case by case seems to be sufficiently flexible regulatory approach, in particular as the use of AI in contract formation is currently only about to kick off.

[201] Mäkelä 2010, 161.
[202] Mäkelä 2010.

Case 2: Airbnb's Smart Pricing

The second example of Smart Pricing seems to be more relevant from the perspective of the first two error types: 1) error of expression, and 2) error in transmitting the expression. In Smart pricing the Airbnb host has to set minimum and maximum limits for the price. The broader the limits are set, the more surprising may the price range be. Furthermore, in other pricing tools, AI might be left with full freedom to decide on the price. Could the Airbnb host rely on the rules of error of expression or error in transmitting the expression, if the Smart Pricing tool unexpectedly starts functioning otherwise than what its principal intended? What if the pricing tool suddenly allows Airbnb guests to book for surprisingly low price?

In the first paragraph of Section 32 (on error of expression) it is first of all required that the error is caused by the contractual party ("a message containing an expression of a person's will, due to a misprint or *other error on his/her part*, differs from what he/she intended"). Furthermore, only if the recipient was in good faith (knew or should have known of the misprint or error), the erroneous message shall not bind its issuer. It would be difficult to argue that the unpredictable behaviour of Airbnb pricing tool would fall under this provision: there seems to be no error, the tool might simply act in a surprising manner because it is based on AI.

When it comes to the second condition, first there seems to be no specific problems to its applicability that would arise from the use of AI technology. The good faith evaluation is to be done taking into consideration the specific circumstances of the case (e. g. was the price exceptionally low taking into account the market price as well as the specific circumstances of the accommodation, such as its location, holiday season etc.). The applicability of the good faith requirement might however be difficult in case also the recipient is using AI based application in making the reservation (good faith will be discussed more in detail in the following section).

As described above, the second paragraph of Section 32 is no longer of much relevance, as it is interpreted so that the error needs to be caused by an intermediary. When compared to traditional online contracting (via a website or emails), it could be argued that in the context of Smart Pricing the AI based pricing tool is actually acting as an intermediary. Due to the actions of the pricing tool, the original intention of the Airbnb host might actually be changed to being something that the host did not intend. It is contemplated whether the relevance of the second paragraph might increase in the future when AI based contracting becomes more usual. This seems unlikely as the second paragraph is inclined

to the will theory, which seems to contradict with the general spirit of the Contracts Act being more leaned towards the reliance theory.

Case 3: High-frequency trading

The discussion in Case 2 seems to be relevant also in the context of high-frequency trading. The scenario in Case 3 is simply more extreme than in Case 2, as in high-frequency trading the intelligent trading agent is typically free to determine not only the price, but the entire trading strategy. Also in high-frequency trading it would be difficult to argue that the unpredicable behaviour of the trading agent would constitute an error of expression. Similarly as argued in Case 2 above, it is tempting to contemplate whether the second paragraph of Section 32 could be applied in case the trading agent ends up acting contrary to what its principal intended.

Conclusion

It seems that the principal of an intelligent agent bears the risk of its unpredictable behaviour. As discussed, it might actually be difficult to argue that the agent acted erroneously, in the first place. Also for this reason, the rules on contractual errors are not likely to be easily applicable. Unreasonable legal consequences of contractual errors may be prevented by applying Section 36 of the Contracts Act.

4.1.3 The concept of good faith

In this thesis it is essentially asked, whether the use of autonomously acting intelligent agents in contract formation might in some cases lead to problems when trying to apply contractual rules to the facts of such cases. Is the role of the human being employing the intelligent agent in some cases so little, that this might affect the applicability of the contractual rules? Bearing this assumption in mind, the criterion for selecting the contractual rules for more thorough analysis in this Chapter 4 was that the applicablity of the rules seem to require strong human involvement, or actually certain state of mind.

The concept of good faith was already briefly touched above. The concept of good faith (in Finnish “vilpitön mieli”) and/or the sentence “knew or should have known” appears in numerous sections in the Contracts Act (Sections 11, 19, 20, 25, 28, 29, 30, 31, 32, 34, 35). The Finnish term “vilpitön mieli”, when translated word by word into English, means honest or sincere state of mind. A general clause is included in Section 33, according to

which a transaction that would otherwise be binding shall not be enforceable if it was entered into under circumstances that would make it incompatible with honour and good faith for anyone knowing of those circumstances to invoke the transaction, and the person to whom the transaction was directed must be presumed to have known of the circumstances.

It follows that two elements need to be established: 1) the contract is made in circumstances that would make it incompatible with honour and good faith for anyone knowing of those circumstances to invoke the contract, and 2) the contractual party trying to invoke the contract must be presumed to have known of the circumstances (objective evualuation).[203] Saarnilehto and Annola have listed some examples, based on preparatory works of the Contracts Act and case law, of the circumstances meant in Section 33 of Contracts Act:

- mental factors due to which the other contracting party is not able to perceive the contents and consequences of the legal act;
- abusing the other party's unawareness of the actual circumstances of the case: abusing information imbalance;
- a person has legal capacity, but it is unable to clearly preceive the effects of his/her behaviour e.g. due to old age or excessive consumption of alcohol or drugs;
- abusing the other party's position (e.g. shortage of money); or
- remaining silent and/or not correcting an erroneous assumption of the other party, that is relevant for the contract formation, even if being aware of it.[204]

In Section 39 it is noted that if, according to the Contracts Act, the validity of a contract or other transaction depends on the fact that the person to whom the transaction was directed neither knew nor should have known of a circumstance or that (s)he otherwise was in good faith, regard shall be had to what he/she knew or should have known when (s)he learned of the transaction. However, if special circumstances call for it, regard may also be had to what the person knew or should have known after the said time but before he/she relied on the contract or transaction.

According to Saarnilehto and Annola, the creation of a legal effect or its extensiveness may depend on whether the other party was in good (or bad) faith: good faith is protected

[203] Hemmo – Hoppu 2019, 6. Sopimuksen tekeminen > Sopimuksen pätemättömyys > Pätemättömyysperusteet > Kunnianvastainen ja arvoton menettely; Saarnilehto – Annola 2018, 130.
[204] Saarnilehto – Annola 2018, 124–129.

by law.[205] In evaluating the good faith, it is essential to analyse, whether the person was aware of certain circumstance significant to the contract.[206] Saarnilehto and Annola further note that, in the Contracts Act, the precondition for establishing good faith is that certain duty to find out about the circmunstances has been fulfilled (Saarnilehto and Annola refer to the Finnish term "perusteltu vilpitön mieli", in English reasoned or justified good faith). This means that it is not only relevant what the person actually knew, but what (s)he *should have known* taking into account the information and circumstances of the case that were reasonably available to him/her.[207] It follows that the evaluation would not only seem to focus on subjective internal state of the person, but what kind of behaviour is objectively expected from a person in certain circumstances.

Saarnilehto and Annola furthermore highlight at which moment the evaluation of good faith is relevant: according to Section 39 of Contracts Act, in the analysis it is relevant what a person knew or should have known when (s)he learned of the transaction. However, if special circumstances call for it, regard may also be had to what the person knew or should have known after said time. However, information that come to the person's attention only after (s)he relied on the contract or transaction, is irrelevant in the analysis.[208] This rule is particularly interensting when applied to high-frequency trading or other contracting scenarios where the intelligent agent can autonomously generate contractual expressions and even perform the contract. It seems very likely that in practice the principal becomes aware of all circumstances of the contract only *afterwards*.

As noted above, in this thesis, the focus is on analysing, how the concept of good faith is applied in case an autonomous intelligent agent is used by one or both of the contractual parties. Weitzenböck has discussed the concept of good faith and fair dealing in the context of contracts formed and performed by autonomous electronic agents in her article published in 2004.[209] Weitzenböck is focusing on *objective* good faith (constituting certain "standard of conduct to which the behaviour of a party has to conform and by which it may be judged")[210] as opposed to *subjective* good faith (according to Weitzenböck's distinction, "subjective good faith has to do with knowledge").[211] By adopting a comparative method, Weitzenböck points out that "the meaning of the principle of good faith in civil law

[205] *Ibid.,* 20–22.
[206] *Ibid.*
[207] *Ibid.*
[208] Saarnilehto – Annola 2018, 23.
[209] Weitzenböck 2004.
[210] Weitzenböck 2004, 85.
[211] *Ibid.*

countries, where terms such as ‘‘honesty’’, ‘‘faithfulness’’, ‘‘loyalty’’, ‘‘fidelity’’ and ‘‘reliability’’ are used, it appears difficult to envisage whether and how such characteristics could be portrayed by autonomous electronic agents. The main difficulty is that such notions refer to the aims, goals or intentions of each party, that is, to an internal state of mind not visible to the other party.”[212]

As a solution Weitzenböck suggests that when analysing the fulfillment of good faith in the context of contracts concluded by intelligent agents, the focus should be on their behaviour (objective approach):

> “It is therefore submitted that the focus should be on behaviour, that is, on conduct observed objectively. On the basis of this, one could attribute mental states (e.g., goals, intentions). The next question that arises regards which, or whose, behaviour should be observed: that of the user or that of the electronic agent? It is proposed that the conduct of both the user and the electronic agent are relevant. In other words, one should determine and examine both the parameters and terms of reference that the user pre-established and those parameters that the agent determined. Both of these have to be in compliance with the good faith and fair dealing requirements.”[213]

> “Furthermore, focusing on the objective criteria of good faith and fair dealing would also facilitate the programming and design of intelligent agent software. As discussed above, it is difficult to envisage how one could design and programme subjective elements without also taking account of desired and expected conduct or behaviour (i.e., objective elements).”[214]

Analysis

At first hand, in practice it seems difficult to distinguish between the behaviour of the intelligent agent and its principal. AI is not yet generally intelligent; could an artificial intelligent be aware of some circumstances and therefore adjust its behaviour to meet the standards of good faith? This would seem to imply that the agent has thorough understanding of the context where it operates as well as the standards of good faith. It is again time to rely on the three example cases and try to concretise the discussion.

[212] *Ibid.*, 89.
[213] Weitzenböck 2004, 91.
[214] Weitzenböck 2004, 104.

Case 1: AI reviewing contract terms

In this first case example, AI is only used as tool to assist the contracting party to make an efficient decision whether or not to enter into a contract on certain terms. The person using such as tool remains the actor that needs to comply with the requirement of good faith. Therefore, this example does not pose any particular problems for the good faith analysis.

Case 2: Airbnb's Smart Pricing

According to Airbnb's Terms of Service for European Users, "(w)hen you accept or have pre-approved a booking request by a Guest, you are entering into a legally binding agreement with the Guest and are required to provide your Host Service(s) to the Guest as described in your Listing when the booking request is made" (section 7.1.7).[215] Therefore, in Smart Pricing, the intelligent agent is responsible for determining only one term of the contract, the price. The host has to actively accept the booking requests made by individual guests and therefore it is the host (typically a natural person), and not AI, that ultimately issues the contractual expression to be bound. Consequently, when applying Section 33 of Contracts Act, the focus is on the behaviour of the host: is the host presumed to have known of the circumstances that would make it incompatible with honour and good faith for anyone knowing of those circumstances to invoke the booking?

What if someone would, after enjoying a decent amount of wine, book several expensive apartments in the middle of the night? Would it be against honour and good faith to invoke such booking? In online world, the contracting parties have more limited means to assess the circumstances of the other party, than in a physical world. In the context of Airbnb, the host only receives the booking request, but it does not smell the alcohol nor notice the inarticulate drunken voice of the person. Also, someone from a different time zone or with exceptional working hours might well book accommodation in the middle of the night. The analysis will always be done case by case, but it seems that in online environment it might be more difficult to rely in Section 33, because the contractual parties typically have little knowledge of the circumstances of the other contracting party.

Also, what if the pricing tool would learn that guests travelling from Switzerland, or people who have already booked their flights, are more prone to accepting higher prices – would it be against honour and good faith to rely on this knowledge and "abuse" it in

[215] See the website of Airbnb https://www.airbnb.fi/terms#eusec201910_2 (last visited 20 April 2020).

setting out the price? The Smart Pricing tool, maybe even the host, probably has access to information on possible guests' behaviour, for instance, what is their maximum budget in the destination in question or how expensive accommodation have they previously booked. There seems to be a considerable information imbalance between the Airbnb host and the possible guest.

Furthermore, dynamic pricing[216] is not only familiar in Airbnb context but it seems to be widely used in online trading. For example, the prices of flight tickets typically change on very short frequencies. Yet, the pricing techniques are not transparent to those whom such pricing is directed. It seems to be likely that a company is pricing its products or services differently depending on each person's profile depending, amongst others, on the browsing history, past purchases, nationality and social framework. At least, to the extent it is not transparent to the consumer that his/her information is used in this manner, it could be argued that such dynamic pricing would be questionable. As noted above, one category of behaviour that is considered to be against honour and good faith is exactly the abuse of information imbalance between the contractual parties.

Case 3: High-frequency trading

High-frequency trading seems to differ from the above scenarios discussed in the context of Smart Pricing. In high-frequency trading there is little, if any, human involvement. Instead, the intelligent agent is autonomously in charge of the planning and performance of transactions. Furthermore, the transactions typically occur at ultra-high speed. Therefore, at first hand, the principal of the intelligent agent does not seem to have a realistic chance to be aware of the circumstances that might in some case be against honour and good faith. However, similar scenarios as considered above might also come across in the context of high-frequency trading or other contracting environments where autonomous intelligent agents are in use. What if the other contractual party is acting in a bizarre way (e.g. due to drunkenness) that the intelligent agent, however, regards as normal behaviour, because it lacks a general understanding of the context where it operates? For a human being bizarre behaviour could have raised suspicion, but not necessarily for an intelligent agent.

As noted earlier, Weitzenböck has suggested that good faith and fair dealing would also need to be taken into account when programming and designing intelligent agent software. Section 33 of Contracts Act on good faith is aimed at being a general clause trying to cover

[216] See more discussion on dynamic pricing from contract law perspective in Scholz 2017.

cases not falling under any other more restricted invalidating clauses of Contracts Act.[217] Therefore, in practise it might be very difficult, if not impossible to try to consider all possible aspects of good faith, when programming the intelligent agent.

Conclusion

In digital contracting the parties typically have little information available on the circumstances of the other contracting party. The parties are to act based on the information they have been provided via a booking form or similar system, and they often have no additonal circumstantial information available. In Section 33 of Contracts Act an objective approach has been adopte: is the other party presumed to have known of the circumstances that render the formation of contract in said circumstances to be againts good faith. In case the intelligent agent is autonomously negotiating and executing transactions, it might be difficult to argue that its principal was aware of possible circumstances that would have rendered the contract avoidable. This conclusion seems dangerous as it could actually lead to a scenario, where principals making use of intelligent agents could simply disregard good faith by "outsourcing" their awareness to an intelligent agent. It seems that the principal should somehow manage to design the understanding of good faith in the behaviour of the intelligent agent. In practise this might be very difficult. Also, the use of AI in contract formation may create a significant information imbalance between the contractual parties, and abusing such information imbalance might be problematic when it comes to complying with the requirement of good faith.

4.1.5 Interpretation of a contract drafted by AI

The last subject to be discussed in this thesis is the interpretation of a contract that has been, to some extent, drafted by AI. The purpose is thus to analyse the general rules and principles of contract interpretation in the case that AI has beed used in the formation of the contract that is to be interpreted.

According to Hemmo and Hoppu, contract interpretation means the exercise of clarifying its ambiguous contents and/or contract term. Iinterpretation may thus also include gap filling if some matter has not beed addressed in the contract document. Contract interpretation exercise is ultimately conducted by the court. The starting point is to look at the wording of the contract. However, there are no limits to the materials that form the

[217] Hemmo – Hoppu 2019, 6. Sopimuksen tekeminen > Sopimuksen pätemättömyys > Pätemättömyysperusteet > Kunnianvastainen ja arvoton menettely; Saarnilehto – Annola 2018, 124.

basis for the interpretation: the materials forming the basis for interpretation may include e.g. emails or memoranda generated before, during or after the execution of the contract.[218] According to Saarnilehto and Annola, the materials supporting interpretation should be relied on in accordance with the following order of preference: 1) mandatory rules, 2) the contract and materials related to it, 3) commercial (or other similar) practise, and 4) default rules.[219]

Annola has provided a detailed roadmap for the interpretation process.[220] According to Annola, the process of contract interpretation may be roughly divided into two phases, which again break into smaller procedural pieces[221]. The primary goal in contract interpretation is to find out the intention of the contractual parties (Phase 1: Interpretation of the parties' intention, in Finnish "tahtotulkinta"). If no acceptable solution is found in Phase 1, the court should procede to Phase 2: distribution of the risks (in Finnish "riskinjakotulkinta"). Phase 2 is always secondary and it is only necessary in situations where the parties' intention remains unclear despite of Phase 1.[222] In Phase 2, the interpretation is based on the principles of contract interpretation. There is no exhaustive list of said pinciples, but the most recognised ones have been listed below.[223]

Contract interpretation is an objective analysis: the actual intention of one of the parties is not decisive, but interpretation shall be conducted impartially and equitably based on the materials available.[224] Also, some principles of contract interpretation have evolved to guide the court in the interpretation exercise:

- According to the *contra proferentem* rule, an unclear contractual term shall be interpreted to the detriment of its drafter;
- According to the minimum rule, in case several interpretations are possible on certain term, such interpretation should be chosen that is least burdensome to the party whose obligations the term in question concerns[225];
- The most reasonable interpretation should be chosen, in case several interpretations are possible[226];

[218] Hemmo – Hoppu 2019, 7. Sopimuksen keskeinen sisältö > Sopimuksen tulkinta.
[219] Saarnilehto – Annola 2018, 148.
[220] Annola 2016, 30.
[221] Within the limits of thesis it is not possible to describe the interpretation process more in detail. for a more detailed description, see Annola 2016.
[222] Annola 2016, 257.
[223] *Ibid.*
[224] Saarnilehto – Annola 2018, 153; Hemmo – Hoppu 2019, 7. Sopimuksen keskeinen sisältö > Sopimuksen tulkinta > Sopimusten tulkintaperiaatteista.
[225] Annola 2016, 277.

- In case the interpretation of a term remains unclear, such interpretation should be chosen that is most in line with common practice[227];
- Such interpretation should be preferred that does not risk the enforceability of the contract[228];
- In case a term is difficult to read (due to e.g. being printed in very small or otherwise unclear letters), it may be regarded as excluded from the contract;
- In case the contract terms contradict with each other, specific rules prevail over more general rules;
- A contractual term that makes an exception to default rules shall be narrowly interpreted;
- According to the principle of loyality, both parties' rights and interests shall be equally balanced in the execution of a contract.[229]

Annola points out that there is no exhaustive list of the principles used in interpretation and also the contents of the principles is ambiguous. Furthermore, there is no hierarchy between the principles, which may lead to difficulties when trying to apply the principles in practise.[230] As already noted, the principles are only relevant in case interpretation is not possible in Phase 1 (Interpretation of the parties' intention). Interpretation in Phase 1 could be unsuccesful, e.g. if the contract includes gaps and therefore there are no materials available to support the interpretation.

It might be that Phase 2 interpretation will be more and more needed in case AI is used in contract formation, when compared to more traditional contracting environments. In case the contract formation process is conducted by autonomous intelligent agents, there might be no supporting documents, such as emails or draft contracts, to lighten on the intention of the parties, which typically form the basis for interpretation in Phase 1. As noted in Chapter 4.1.1., it might be difficult to establish the parties' specific intention in the first place, of an autonomously acting agent is involved. Furthermore, the default rules and commercial practice might also be silent on the use of new technologies in contract formation. As Annola has noted, the principles used in Phase 2 interpration are open-ended

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[226] *Ibid.,* 282.
[227] *Ibid.,* 283.
[228] *Ibid.,* 288.
[229] Hemmo – Hoppu 2019, 7. Sopimuksen keskeinen sisältö > Sopimuksen tulkinta > Sopimusten tulkintaperiaatteista.
[230] Annola 2016, 259.

and their mutual hierarchy is unclear. Therefore, it is carefully suggested that the increasing reliance on Phase 2 interpretation might lead to increasing legal uncertainty.

Another matter to be taken into account is that it might be that the contract is not written in natural language. The starting point in contract interpretation is the interpretation of the contractual text: the purpose is to primarily try to find out the parties' intention from the wording of the contract. Namely, Annola has divided Phase 1 into two sub-phases: textual interpretation and context interpretation.[231] Textual interpretation might not be possible, at least as it is currently perceived, in case the contract is only available in machine readable format. Source code is typically human readable, but it is quite different from the language typically used in contracts. Furthermore, e.g. in the context of high-frequency trading, the source code might include only the general framework, but no detailed instructions for the behaviour of the intelligent agent. High-frequency trading and other forms of computational contracts have been described more in detail in Chapter 2.1.5.

There seems to be little written on the interpretation of contracts drafted by intelligent agents. Ying has briefly discussed this from a comparative perspective.[232] Ying suggests that the parties' intention relevant for contractual interpretation could sometimes be well documented in case the software used in contracting keeps a log on the parties' activities (e.g. actions to delete, add or amend certain terms in the contract).[233] Ying is also questioning, whether the *contra proferentem* rule should apply to a party who used software to draft the contract on his/her behalf. Ying suggests that the party deciding to use software for contract drafting purposes should bear the risk that the software might end up drafting ambiguous terms – and therefore the rule should also apply to such party.[234] Another question is whether said party could claim damages from the software developer.[235]

Analysis

As contract interpretation is always a case by case analysis and there are several principles that may be applicable, depending on the case, it seems unfeasible to provide a detailed analysis on interpretation issues on the case examples. In the light of the above discussion it seems sufficient to note that, again, the level of autonomy of the intelligent agent is

[231] *Ibid.,* 167.
[232] Ying 2017.
[233] Ying 2017, 51.
[234] Ying 2017, 52.
[235] See Ying 2017, 52–53.

relevant. Is AI only used as a tool, or is AI independently in charge of drafting some terms or even the entire contract?

Case 1: AI reviewing contract terms

When it comes to the first case, AI is only used as a tool and therefore does not act in an autonomous role. It might be, though, that as AI is used in the process of reviewing the terms of the contract, there remains more documentation on the intention, for example which clauses were chosen to be removed or amended.

Case 2: Airbnb's Smart Pricing

Also in the second example case, AI is mostly used as a tool. Yet, it is empowered with autonomy with regard to one term: the price. The autonomy is however limited to a defined prince range. Also in this context, the use of intelligent agent might actually end up generating more documentation to support the interpretation later on: in Airbnb platform the parties' search data, past agreements and the commercial practice is probably saved in the system in a relatively organised manner.

Case 3: High-frequency trading

In high-frequency trading the trading algorithm might be acting very autonomously. This means that there might be little supporting documentation for the contract interpretation exercise – or the material might only be available in machine-readable format. It follows that the princpiles of contract interpretation might be needed more often than in the context of more traditional contracts, and as the principles are relatively vague, this might lead to legal uncertainty. On the other hand, the principles might provide a sufficiently flexible tool to address contract interpretation cases in the era of AI.

Conclusion

In Finnish contract law the interpretation exercise is an objective analysis: it is not relevant to establish the subjective (actual) intent, but the objectively perceived intention of the contracting parties. In this respect, the materials available to support the interpretation exercise are significant. It might be that some software includes an extensive log of the parties' actions and thereby provides relevant information on the parties' intentions. On the other hand, some documentation might only be in machine-readable format and thereby difficult to use for interpretation purposes. Also, it might be that due to the high level of

autonomy of the intelligent agent, there is little if any relevant documentation to support the interpretation exercise. As noted above, in such a case it might be necessary to rely on the principles of interpretation, which might not be the best outcome for legal certainty. On the other hand, contract interpretation is always to be performed case by case and therefore its results are always to some extent unpredictable. Interpretation in accordance with the principles might also constitute a sufficiently flexible tool to address the new generation of digital contracts.

CONCLUSION

The purpose of this thesis was to evaluate, in the Finnish context, whether the increasing use of AI imposes a need to revise the rules applicable to contract formation. This thesis thereby aimed at concretising the lively discussion around the regulation of AI, from a contract law perspective in particular.

The adequacy of the Finnish contract law regime was analysed by trying to apply contractual rules to a selection of three artificial intelligence based contracting technologies: 1) AI reviewing contract terms, 2) Airbnb's Smart Pricing tool, and 3) high-frequency trading. The analyses focused on four hypothetically problematic subjects:

- Expression of intent
- Error of expression
- The concept of good faith
- Interpretation of a contract drafted by AI

First of all, it was observed that AI is being used as an umbrella term for various kinds of technologies. In some applications the AI based intelligent agent might act significantly more autonomously than in others. Therefore, also the role of AI in the contract formation process may be manifold. At simplest, AI may be used as a tool in automating certain function in contract formation process. AI may also be used in more demanding tasks, such as, in negotiating and performing the entire contract independently.

The expression of contractual intent has triggered a lot of discussion internationally amongst academia. However, from the perspective of the Finnish contract law regime, the arguments presented do not seem too relevant. The Finnish rules on the expression of intent are not entirely clear, but they seem to provide a sufficient mechanism to analyse the expression of intent when an autonomously acting intelligent agent has been used in

contract formation. It seems to be difficult to argue that the use of an autonomously acting intelligent agent in contract formation would hinder the adequate formation of contractual intent.

On the other hand, it was analysed, what are the legal consequences in case the intelligent agent acts otherwise than what its principal intended: are the rules on contractual error adequate in such a case? It was observed that because AI functions as well as the quality of its input data, it is questionable whether AI actually ever makes mistakes – or merely acts in a way that its principle could not foresee. For this reason it would seem to be difficult for a contracting party to try to rely on the rules on contractual errors.

The third point to be analysed was the concept of good faith. In digital contracting the parties typically have little information available on the circumstances of the other contracting party. Therefore, it might be difficult to argue that the principal of an autonomously acting intelligent agent was aware of the circumstances that would render the contract voidable. In the worst case, this might end up encouraging someone to disregard the requirement of good faith. Another observation that was made regarding good faith was that use of AI may create a significant information imbalance between the contractual parties, and abusing such information imbalance might be problematic when it comes to complying with the requirement of good faith. This third aspect might require further investigation and possibly regulatory clarification.

Lastly, some observations were made on the interpretation of a contract that has been, to some extent, drafted by AI. In this respect the effects of the use of AI seemed to be twofold. On the one hand, the use of AI might lead to a situation where the intention of the contractual parties is better documented than normally. The documentation may serve as useful material for the contract interpretation exercise. On the other hand, in some cases the available materials might be very minimal, or in an unusual format. In such a case, it might be necessary to rely on the principles of interpretation, which might not be the best outcome for legal certainty. It can also be argued that the principles might constitute a sufficiently flexible tool to address the new generation of AI based contracts.

In conclusion, it is too early to suggest that the Finnish rules on contract formation should be revised based on the above observations. Instead, the Finnish contractual regime seems to be sufficiently flexible to regulate the emerging AI based contracting technologies. However, it is important to be aware that when relying on AI in contract formation, some contractual rules cannot necessarily be relied on similarly as in the context of other forms of digital contracting.

As Moore's law correctly predicted, AI is a rapidly developing field of research. Therefore, the observations on how AI is currently being used in contracting are soon likely to be out-dated. Hence, it is necessary to continue to observe how the characteristics of AI develop and how AI is being used in contract formation in the future.